NOTES ON HONEYLOCUST

Compiled by S. B. Detwiler
Soil Conservation Service, U.S.D.A.

June 1947

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(Assembled quotations from publications in the U.S.D.A. Library and reports in S.C.S. files, with personal notes and comments. The extracts quoted are roughly classified under headings which indicate their major subject-matter interest. These data are not condensed into summary form because it is believed that those especially interested in the honeylocust will find the abstracts of greater value. Occasionally quotations were condensed, but in such cases the notes closely follow the author's wording. "Station" refers to the State Agricultural Experiment Station, unless otherwise qualified. It is hoped that those reviewing these notes will call the compiler's attention to important references which should be included when a digest of this material is made. ---S.B.D.)

GLEDITSIA SPECIES AND VARIETIES

Gleditsia aquatica Marsh. - Water or swamp locust. Native, U. S.
" texana Sarg. - Texas honeylocust. Hybrid of G. aquatica and G. triacanthos.
" triacanthos L. - Honey or Sweet locust; Three-thorned acacia. Native, U. S. Natural range shown on accompanying chart, copied from USDA Misc. Pub. 287, 1938. Honeylocust varieties are:
" " var. inermis Willd. Thornless honeylocust, found as scattered trees in most localities where the species occurs. It differs in some minor characters but readily cross-pollinates with G. triacanthos, and both have the same planting range.
" " var. elegantissima (Grosdemange) Rehd.
" " var. Bujotii (Neum.) Rehd.
" " var. nana (Loud.) Henry.
" japonica Mig. - Japan, China.
" Delavayi Franch - Southwest China.
" sinensis Lam. - China.
" amorphoides Taub. Argentina, Bolivia.
" australis Hemsl.- South China.
" caspica Desf. - North Persia.
" ferox Desf. - China.
" heterophylla Bunge - North China.
" macrocantha Desf. China.
" officinalis Hemsl. Central China.
--(Bailey, Encyclopedia of Horticulture, 1935)

All of these species and varieties have been planted in the United States except possibly G. amorphoides. Horticultural selections of G. triacanthos are described in the section on "Prize Contests".

NOTE ON TEXAS HONEYLOCUST

Parks (Tex. Sta. Bul. 551, 1937) recommends the Texas locust for planting in eastern, central and southern Texas rather than G. triacanthos, which "has long been used as an ornamental and deserves a place where collections of trees or specimen plants are grown". Of G. texana, he says: "Texas Locust. A tall-growing honeylocust native to sections 4, 4B, and 2 (east central Texas), and occasionally found in other sections of the state. Differing from honeylocust, it bears no thorns or sometimes a few. The foliage is similar but one will find pinnate and bipinnate divisions with the same leaves. This does not occur in honeylocust."

Several trees of Texas honeylocust that were planted in the Boyce Thompson Southwestern Arboretum at Superior, Arizona, made erect, highly vigorous growth under the trying conditions of a hot, dry climate. The appearance of these Arizona specimens suggested that they may possess "hybrid vigor" and thus may have superior vitality for their establishment in erosion control planting on difficult sites. This species is worthy of systematic tests in SCS observational plantings.

Sudworth's Check List of Forest Trees (1927) indicates G. texana is "probably a hybrid between G. aquatica Marshall and G. triacanthos L.", and reports it as occurring in the Brazos River bottomlands near Brazoria, Texas; along the Red River, near Shreveport, La.; near Yazoo City, Miss.; Davis Pond, Knox Co., Ind.; and near Skelton, Gibson Co., Ind. G. Schneck found two trees of this hybrid in Illinois (reported in Plant World, Oct. 1904).

C. C. Deam (Flora of Indiana, 1940) says of G. texana: "This species was first found in Gibson and Knox Counties and was considered a hybrid of the preceding species. Later, Sargent described it as a species from a colony found in Texas. In 1921 I found a fine specimen in a cornfield under which there were hundreds of 1-year seedlings, which proves that if this form is a hybrid, it is a fertile one."

The fruit is a dark-brown, many-seeded pod, 4 to 5 inches long, 1 inch wide, dry and without the sweet pulp found in G. triacanthos pods. Hence Texas honeylocust lacks the possibility of using the pods for forage. The seeds, however, are equally as valuable as those of the common honeylocust for production of the mucilage powder used in paper manufacture to impart wet-strength and other desirable qualities to paper (see Appendix 2). According to G. R. Green (Trees of North America, Vol. II, 1934), the wood is hard, heavy and close-grained; and the tree forms a narrow crown, attaining 100 to 120 feet in height and 2½ feet in diameter.

GLEDITSIA TRIACANTHOS -- [illegible]

All following data refer exclusively to the common honeylocust, except for information in the appendix on mesquite and carob.

BOTANICAL. "Gleditsia triacanthos. Sweet Locust. To 150 ft., with simple or 3-branched spines to 4 in. long, unarmed in var. inermis; pods to 1½ ft. long, becoming twisted. Pa. to Fla. and Tex. Var. Bujoti has drooping branchlets. -- In the Middle West pods are ground into livestock feed, being highly nutritious; heavy-bearing hort. vars. have been developed. -- G. aleesantrigata, a bushy unarmed form of G. triacanthos." --(Bailey, Hortus Second, 1941).

* * *

"In the forest, honeylocust usually does not have a trunk quite as straight and clean as black locust. The twigs have a zigzag growth and 4 or 5 buds are found at each leaf scar, but only the upper one can be seen and that is exceedingly small. The flowers appear late in the spring, in small greenish clusters. They are fragrant and honey-laden but not showy, nor are they pea-shaped, like those of the black locust. Each cluster is composed entirely of either pollen-bearing or pod-forming flowers. Sometimes both kinds of clusters are found on the same tree; at other times they are on separate trees." --(S. B. Detwiler, Amer. For., Feb. 1937).

* * *

The extent to which honeylocust is dioecious or polygamous is important to those desiring to grow this tree for forage crops. That botanical authorities are not in agreement on this matter was made plain in an office memo by B. S. Cunniff, Apr. 1, 1940. Botanical descriptions quoted in this memo show that Gleditsia triacanthos is considered to be polygamous by Bailey, Britton, Britton & Brown, Britton & Rose, D. J. Browne, A. Gray, Illick, Matthews, Rehder, Rydberg, Sargent, Tidestron, and many other authorities. On the other hand, honeylocust is described as polygamo-dioecious or dioecious by at least four botanists, viz., G. R. Green (Trees of North America); F. C. Gates (Trees in Kansas); J. H. Schaffner (Flora of Ohio); and J. K. Small (Southeastern Flora). If honeylocust is fully polygamous, each individual tree is capable of producing fruit. If it is fully dioecious, the male trees can bear no pods, yet must be present in the plantation in order to pollinate the pistillate trees. But if honeylocust trees are polygamo-dioecious, it is highly important to know exactly what this term implies.

Rehder's "Manual of Cultivated Trees and Shrubs" (1940) defines polygamous as: "Bearing unisexual or bisexual flowers on the same plant", and dioecious as: "Staminate and pistillate flowers on different plants". Webster's dictionary defines polygamo-dioecious as "Having some plants polygamous and some dioecious in the same species"; according to Funk and Wagnalls' dictionary it means: "Polygamous, with a tendency to become dioecious". Evidence that honeylocust is polygamo-dioecious is found in the following state-

ment by Coker and Totten, "Trees of the Southeastern States" (p. 24, 1934 ed.): "In regard to the (honeylocust) fruits, we have seen no reference to the fact that individuals are often found that are almost or entirely sterile." It is probable that Coker and Totten's non-bearing trees produce only staminate flowers.

* o *

Valuable information on honeylocust flowering habits is furnished by J. C. Moore in his office report on progress of cooperative Soil Conservation Research in 1945 at the Alabama Station, as follows:

"A careful study of the fruiting habit of honeylocust trees growing native in Alabama and Georgia gives an interesting sidelight on what has been origiuslly called "alternate bearing". This study reveals that some trees are definitely males bearing only staminate catkins, other trees bear pistillate catkins with flowers containing aborted stamens, while still others bear both pistillate and staminate catkins from the same fruiting spurs. A good crop of fruit has been harvested 5 years in succession from a tree bearing both pistillate and staminate catkins. In budded selections of Calhoun and Hillwood honeylocust we find the three flowering conditions mentioned above. It usually holds true that a heavy crop of pods draws heavily on the reserve food of the tree, thus creating a poor condition for fruit bud formation the following year. Some trees bear a heavy crop one year and some the next, thus giving assurance of feed every year when several trees are growing on an area."

* o *

The bearing habit of honeylocust trees is discussed in these notes under the head of "Fruiting Habits". Regularity in production of pod-crops is of primary interest to those growing honeylocusts for forage purposes. The date of flowering bears on regularity of fruiting, since crop trees that bloom in the unsettled weather of early spring are liable to frequent blighting of the blossoms by frost.

Around Philadelphia, Pa., honeylocust begins to bloom between May 11 and June 1, according to the warmth of the season. In that locality the first leaves unfold between May 3 and May 24 (Mackenzie, Contrib. Bot. Lab. Univ. Pa. 3: 288-427, 1911). At Manhattan, Kans., flowering starts as early as April 30 or as late as May 20 (Irish, Contrib. #8, Bot. Dept., Ia. St. Coll., 1898). At Ames, Iowa, honeylocust began to flower on May 17, 1886. A comprehensive phenological chart of forest tree species, by G. Lamb, is published in supplement No. 2, Monthly Weather Review, U. S. Weather Bureau, Sept. 4, 1915, with a bibliography. The average dates for honeylocust as shown in this chart are:

	In South		In North
First leaves appear	April 20		June 4
Flowering begins	May 7		June 25
Seeds ripe	Sept. 15		Oct. 20
Pods fall	Oct. 15	to	Dec. 31
Leaves fall	Oct. 30		Oct. 1

Apparently, honeylocust blooms so long after the last killing frost in the spring that under usual conditions there is no frost-danger to the crop.

A botanical problem that needs to be studied is the morphological character of honeylocust trees native to the southern states as compared with those in the north. This applies especially to differences in the thickness and fiber content of the pod. Studies of comparative sugar content of pods from different regions also are needed. The prize contests for sugar-rich honeylocust pods emphasize differences in pod characters in the South from those of the North. The Journal of Heredity, May 1928 (p. 217) reported: "One of the most interesting features brought out by the contest is the existence of two types of honeylocust beans, which may conveniently be called 'Fatback' and 'Razorback'. The difference between them is as striking as that between a pure-bred Berkshire and a shoat in some backward community. All the fatback beans were sent from points in the southern United States, and it is yet to be learned whether this type is hardy in the northern range of the species."

* * *

A systematic survey of honeylocust trees growing in the northern portion of the United States probably would locate hardy selections bearing pods of high sugar content. This view is supported by the following information given by Thomas Mitchell, 16 East 48th St., New York City, in a letter to the SCS of Nov. 5, 1944: "I mailed you some root cuttings of a honeylocust (triacanthos) which has the sweetest fruit of some 2,000 trees that I have examined here. I call this variety '3X'. It has borne fruit 7 out of the past 8 years, missing only in 1943. The fruit is small compared to some of the southern varieties that I have seen. This 3X tree was blown down by the hurricane and I sent you the root cuttings in the hope that you may be able to save the variety. The tree is in the Brooklyn Botanic Garden." (The SCS Nursery at Beltsville, Md., reports that these cuttings failed to grow.)

* * *

Dr. Henry Hepp has reported on the results of a study of growth-form variations in black locust (Jour. For., Jan. 1941). He states: "The species is variable, giving rise apparently to several growth-forms which seem to be distinct genetic types. Inasmuch as these forms are associated with large differences in yield, recognition of their existence should be helpful in orienting further work on the selection of genetically superior strains." There is reason to believe that a study of honeylocust would bring to light genetic differences, as indicated by the letter quoted below.

"Dr. C. F. Swingle, in 1933, considered that the thick-podded form of G. triacanthos found in the South is so distinctly different from the ordinary type of the species as possibly to constitute a distinct botanical variety. I am familiar with the honeylocust in northern Virginia, Maryland, and Pennsylvania, and the pods are thin and dry. Mr. Britt and I looked at more than 500 honeylocust trees

in the District of Columbia and nearby Maryland in 1938. We found only one tree (at Peace Cross, Md.) that did not have merely dry fiber in the pod-shell, and that tree was too poor in sugar content to consider as a selection. In 1934, I examined many honeylocusts in the vicinity of Statesville, N. C., and all had fat pods. One fence row with about 30 trees had young stock standing under the locusts and the pods were eaten as they fell. At my old home in Pennsylvania, honeylocusts were fairly common in the pastures but the cattle seemed not to relish the thin pods." --(Letter of Aug. 15, 1940, from S. B. Detwiler, SCS, to O. A. Atkint, Auburn, Ala.)

* * *

PLANTING RANGE. Honeylocust has been planted in every state and is now widely naturalized outside of its natural range. In USDA Misc. Pub. 303 (1938), Van Dersal lists this species for his plant-growth regions 16, 20, 23, 24, 25, 26, 27, 29 and 30, which extend to the Canadian boundary from Maine to Minnesota. Rehder's "Manual of Cultivated Trees and Shrubs Hardy in North America" (1940) recommends honeylocust for planting in Zone IV and southward (see accompanying chart). If planted for forage, it is probable that the pods will not always properly mature because of early frosts north of 43° latitude. The clones selected for high forage quality originated in the South. Even as far south as Lancaster, Pa., 15-year-old grafted selections of honeylocust, planted on the L. K. Hostetter farm, Route 3, had branches killed in the severe winter of 1944-45. A more extensive discussion of winterkilling appears in the section headed "Damaging Agents". Under "General Notes by Regions", additional information is given on planting range, site requirements, management, etc.

____ Natural range of honeylocust.

.... Northern limit of Rehder's Zone IV.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Lapply discovered that older stations [illegible] and, also and willow near the upper and middle, [illegible] are found on the higher elevations. ... The [illegible] of [illegible] species as revealed in this study, confirms the view that while the sycamore along the upper portions of the stream is [illegible] vegetation, that along their lower course is a part of the geologically undeveloped condition of the floodplain.*

In the study by Yeager et al, Sycamore is placed as a pioneer [illegible] species, and forms part of the development on the sandbars [illegible] and contiguous lower slopes. Above the floodplain [illegible] a half-mile or several miles wide, the nonsycamore trees [illegible] "Tulip [illegible] Hardwood" but, on the floodplain less subject to scouring, Sycamore and willows often appear as important [illegible] ash, walnut, and hackberry being the most abundant floodplain species, the sycamore identified in some most frequently overflown.

* * *

Above the Republican River in Ring and Cloud Counties, Kansas, the young timber belts are made up of a zone of the [illegible] willow, a zone of the black willow, and a side zone of [illegible]. I have had some of these young timber belts under observation for nearly twenty years, some from their very beginning, and I find that it is only after the cottonwood has formed a [illegible] forest of good sized trees that other trees appear in the [illegible] to take possession of the soil. ...The trees which [illegible] and the cottonwood are few in number and one of the [illegible] species: Rhamnus caroliniana Walt., Prunus pumila L., [illegible] dioicus triacanthos L., Corylus americana L., [illegible] [illegible] Ulmus fulva Mich., Ulmus Americana L., Celtis occidentalis L., [illegible] [illegible] L., and Juglans nigra L." --(F. E. Schaffner, Ed. Sci., Vol. [illegible])

* * *

Albertson and Weaver (injury and death or recovery of trees in prairie climate, Ecological Monographs, Vol. 15, No. 4, Oct. 1945) state: "The most xerophytic species and consequently that of greatest value in the sub-climax history. ...A score of other species of trees and shrubs in these forests near the Missouri River, including some of all the upland species previously mentioned and also red cedar, [illegible] [illegible], and redbud and honey locust. These all occur, but sporadically and in other communities as well."

[illegible]

[illegible]

[illegible]

[illegible]

* * *

[illegible] Tract some of the following indigenous species is [illegible] [illegible] is to 10 inches apart and the plant is permitted to [illegible] for a single year on the road but before transferring it [illegible] the following spring should be used the work of [illegible] part of road bed. ...Sunflower - 1/2 to 1/2 pound. When the [illegible] is transferred to the Immigrant Road after the first year [illegible] Tulip Poles on this road can be straightened [illegible] [illegible] road remains in the road bed for a second year or more are [illegible] and also spaced, [illegible] as much seed should be used. [illegible] Kansas, Seeding and Planting in the Prairies of Texas [illegible]

* * *

Fences and Hedges Collected honeylocust seeds in the fall of 1911. [illegible] Journal that I sent seed in the fall for 40 years. Elected in the [illegible] on April 1, 1918, [illegible] had persimmons to [illegible] collected in the fall of 1917 germinated [illegible] in the greenhouse in the spring of 1918. —(From, Iowa Seed, [illegible] 1918, [illegible]

* * *

Honeylocust is a good seeder and bears quite abundantly after [illegible] years of age, mentioned earlier. The seeds can be gathered in a legume and may usually be gathered in the fall and placed where they can dry out. When the pods are to readily remove all the seed will fall out. The seeds are so hard in the fall of [illegible] that is quite hard. Freezing will not injure them, but they should not be allowed to become very dry. If kept until spring, they should be placed in hot water and kept warm until the seeds swell so much as that before they were to plant. For any trying or seeds that will grown [illegible]. It may be necessary to soak the seed several times, removing all that have swelled before [illegible] lots. They may be planted in the seed-bed in rows 3 inches apart and 1 inches apart in the row, and from one-half to [illegible] of an inch deep. The soil should be kept moist until the plants are well established. If all things are favorable, the seedlings will [illegible] a height of 10 to 12 inches the first year. They may be removed from the seed-bed about 1 or 2 years old. Transplanting and cultivation of the ground into which they are to be placed. Transplanting in the nursery is not necessary. Although it [illegible] recommended the planting out all trees in permanent [illegible] that stand in the forest." (Filipino, a teacher [illegible] averages 3,000 seeds per pound, and a bushel will [illegible] of [illegible]. Germination of these seed ranges from [illegible] percent. The seedlings average 5 inches in height, and [illegible] years of age.) —(C. E. Bilbo, Important [illegible] [illegible] 1916).

* * *

[illegible]

[illegible]

[illegible]

[illegible]

"Since pond water is usually [illegible], a [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

"Plantations containing two or more species in mixture are so few and of such recent planting that it is not possible to refer to them as examples, but sufficient evidence has been collected to show that under certain conditions it is preferable to plant certain species together. ...Below are given a few species which may well be planted together: Honeylocust with hackberry. Honeylocust with jack pine. ...Green ash with honeylocust."

Table 2 recommends heavy loam as the most suitable soil for honeylocust, 10 by 10-foot spacing, giving a yield of small posts and cordwood in 5 to 10 years; and first-class posts in 20 to 25 years.
--(S. D. Smith, Advice to Forest Planters in the Plains Region, Farm. Bull. 888, USDA, 1917)

* * *

"It (honeylocust) is light-demanding, and if not crowded will generally branch out low down, and instead of throwing up a single stem there will be several of them struggling for supremacy. In this it exhibits the same objectionable features as the common locust. Advantage has been taken of this tendency in planting it for hedges and fences. If cut back to near the ground when young, it will throw up numerous branches, and if properly handled will form an almost impenetrable barrier, which is made more formidable by its thorns. It does not sucker from the roots unless they are wounded."
--(Elliott, The Important Timber Trees of the U. S., 1884)

* * *

A 10-row farmstead shelterbelt, 1/8 mile long, was planted on the A. T. Heinig farm, Sedgwick Co., Kansas in 1940. The rows were subsoiled to a depth of 20-24 inches, before planting, and kept well cultivated afterward, resulting in 100% tree survival. The first row on the windward side is desert willow, pruned to keep the branches low. The second row is cedar, which with the Austrian pine--allows little wind movement near the ground. The fourth row is black walnut; the fifth, catalpa; the sixth, green ash; the seventh, honeylocust; the eighth and ninth, Russian olive; and the tenth, Russian olive. The rows are spaced 8 feet apart. Weeds have found no harbor in this plantation and the soil is kept in excellent tilth.

"Mr. Heinig has some conclusions as to what he thinks would be an improvement for similar plantings. He would prefer a wider-row planting, allowing at least 12 feet between rows, so that the trees could be cultivated with the usual farm implements. The first 3 rows on the windward side would be the same whether he had desert willow pruned 4 feet in the row; peach and chokecherry 12 feet apart in the row. The 4th row would be catalpa; the 5th, black walnut; and the 6th and 7th, green ash. The 8th, honeylocust; the 9th and 10th, Russian olive. The reason for the Russian olive is that it has been quite resistant until recently. Some of the older Chinese elm

[illegible]

[illegible]

[illegible]

[illegible] is very high. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Symbols or points [illegible] were [illegible] in all cases." [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible] [illegible] [illegible] [

[illegible]

[illegible]

[illegible]

Cogl. lists four large honeylocust trees growing in full sun in front of his home. He states: "From early spring until dry summer weather, the grass under these honeylocusts is so dense and vigorous in its growth that it is harder to cut it with a lawn mower in the area of locust roots than in the open lawn. This good grass growth extends about 2 feet inside the area shaded by the crowns of the locusts. The trees quickly use up the available soil moisture during dry summer periods, causing the grass blades to die and the grass cover to become thin despite application of water from a hose."

On the Washington estate at Mount Vernon, Va., there are many honeylocust trees. Observations made by S. B. Detwiler indicate that these trees aid the growth of grass and also of red clover. Where this effect is most noticeable is south of the barn, on the west side of the path leading to Washington's tomb. Near the barn is a honeylocust tree about 45 inches in breast-high diameter, with a correspondingly wide-spreading crown. Nearby is a clump of five trees, 16 to 25 inches Dbh., apparently originating from the sprouts from an old stump. The barn was built in 1762, and Washington's letters indicate the honeylocust trees were planted at about that time. At any rate, these old trees near the barn have stood for a sufficient number of decades to be especially good specimens to use for a study of their effects on grass. Young honeylocust trees, 6 to 11 inches Dbh., and a black walnut tree border the path to the tomb, south of these ancient trees. The sod under the young locusts is visibly denser and better than in the open, but the sod under the walnut tree appears to be considerably denser than under any of the honeylocusts.

The clump of 5 trees that apparently grew from an old stump bore an estimated 35 bushels of pods in 1946. These pods heavily littered the ground over a wide area of the field under and near the tree. It seems possible that these pods furnish abundant food for earthworms, and that the soil-improving activities of a large earthworm population under the locust trees may account for the good growth of grass and clover. (Cf. Hopp, under "General Notes", Region 2, Va.)

"The Effect of Shade on Pasture" is reported by Dr. L. R. Neel in Circular 65, Tennessee Agricultural Experiment Station (1939). At the pasture testing substation at Columbia, Tenn., Supt. Neel planted a pasture lot to black locust trees spaced 30 feet apart, and another lot to black walnut trees, 25 feet apart. A third pasture lot, unshaded, between the two that were planted, was used as a check. Grazing tests were begun in 1932, using yearling beef steers of about 500 lbs. weight at the start of grazing each spring. The average annual results were:

[illegible]

[illegible]

[illegible]

[illegible] Farmers' Bulletin [illegible] Middle Potomac Experiment Station has been running 11 years. In this period of time the check lot has yielded 7.1% carrying capacity; the lot shaded with walnut trees, 15% and the lot shaded with black locust trees, 12%. These figures likely are too favorable for the locust-shaded lot, as it has the poorest soil and hence the most opportunity for improvement. In addition, the fact that the locust trees were set on the pasture last, this lot now has the best sheltered use."

"Rate of beef gain per day is a little better on the check lot, probably because of the greater amount of herbage in this lot. Trees have been pruned high, but probably have again reached the point where some thinning is needed, since the objective is only marginal shade at times during the day."

* * *

H. H. Smith reported on "Some effects of black locust and black walnut on southeastern Ohio pastures" (Soil Science 51: 385-394, May 1941). The effect of walnut and black locust in conservation of the soil is evaluated by Smith as follows: "Amounts of nutrients returned to the following year be added annually to the surface soil in the litter from isolated walnuts are located: Ca, 100 to 150 pounds per acre; P, 5 to 7 pounds; nitrogen, 20 to 35 pounds. These values are based upon an estimated annual litter fall of 1,500 pounds of dry matter per acre, and a number of samples of litter collected immediately after it was fallen from the trees in 1939. The fact that there is an appreciable build-up of bases in the surface soil under walnuts from the relatively small annual contribution of the litter indicates that the combination of walnuts and grass is a very efficient system. The minerals used by the grass are probably derived mainly from soil horizons below the layer occupied by grass roots. Leaching losses probably are slight."

Relative to the effects on grass of pasture trees in general, Smith offers points which are helpful in judging the probable effects of homelocust on grass, as follows: "The effect of trees upon pasture grasses cannot be considered as a simple phenomenon with a simple cause. Rather it represents the net effect of the alterations introduced by the tree, that is, the reduced light, the tree leaf fall, the tree root competition with the grass and with weeds, and the many indirect reactions of these factors through soil conditions, soil moisture, soil temperature, and soil organisms. Whether this net effect is beneficial or detrimental depends upon the type of pasture, the type of soil, the climate, and the season, as well as upon the type of tree. A clearer understanding of the factors involved is essential to accuracy in the prediction of results." . . .

[illegible] [illegible] [illegible] [

[illegible] pH value of the soil is normally 6.0 or less. The effect of the litter of [illegible] tree species is [illegible]

In this connection, a paper by C. H. Gorrham [illegible] of different tree species [illegible] differences [illegible] to the type of humus present in the soil. The [illegible] of this paper, published in Soils and [illegible] 1941, [illegible] jobs:

"To test the rate of cellulose decomposition, strips of filter paper were placed on mixtures of leaves of various species [illegible] a good forest mull, and (b) a spruce mor. Both on the mull and on the mor the most rapid decomposition of the filter paper occurred with mixtures including leaves of alder, nettle and [illegible]. Decomposition was also stimulated to a smaller extent by the presence in the mixture of leaves of elm, hazel, Prunus serotina, various species of ash, and sycamore maple. Mixtures including leaves of beech, birch and oak did not stimulate decomposition. Of the conifers, Norway spruce needles inhibited decomposition on the mull but stimulated it on the mor, whereas those of larch and Douglas fir inhibited decomposition on the mor and had no favourable effect upon the rate of cellulose decomposition.

"Comparison of the two series shows that, on the whole, the species whose leaves decompose most rapidly also stimulate the decomposition of other cellulosic matter on the soil; but provided that light is kept insufficient for undesired growth, [illegible], the introduction of species with readily decomposed litter should promote decomposition in general and improve the condition of the humus."

It seems probable that the litter of leaves, [illegible], and twigs cast on the ground by honeylocust trees is as beneficial to soil formation as the litter shed by the black locust. But until specific research on this point is done, the effect of this tree on [illegible] remains a matter for individual judgment based on field observations.

* * *

The TVA is conducting cooperative tests of honeylocust as a shade and forage tree, according to a paper by L. V. Allee in [illegible] Forests (Oct. 1941). He states: "It is fairly well known that the (honeylocust) pods are eaten by cattle and a few authentic cases are on record of their use in cattle rations with apparently not adverse results. It has been suggested that these pods would make a good supplemental fodder for livestock and that the trees could be grown on steep, rough lands. The possibilities of such uses for honeylocust were judged sufficiently promising to warrant investigation. The first steps were taken with efforts to locate outstanding trees in regard to the production of nutritious pods. This was followed by chemical analyses of feed value, feeding experiments, [illegible] experiments, and certain minor studies relating to propagation and crop production of the species.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The [illegible] results of the contest [illegible] "Pennsylvania" honey locust [illegible] J. Russell Smith [illegible] Pennsylvania State College. Feed value of these six entries [illegible] of honey locust pods."

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Moisture	4.76	3.57	5.02	4.52	[illegible]	[illegible]
Ash	3.74	4.29	2.78	4.00	[illegible]	[illegible]
Protein	8.58	10.81	9.94	7.20	[illegible]	[illegible]
Crude fiber	12.58	16.29	15.16	17.97	16.81	[illegible]
Fat	1.27	1.01	2.04	1.07	[illegible]	[illegible]
Nitrogen-free extract	69.07	63.87	66.46	64.87	[illegible]	[illegible]
Sugar	31.48	25.40	27.41	30.35	[illegible]	[illegible]

"The outstanding thing is that in four of the six prize-winning [illegible] sugar made up more than 30% of the total weight of pods and [illegible]. Why have we neglected the honey locust as a sugar producer?" says Dr. Smith.

"Most of the protein is in the seed. Aside from sugar, the locust [illegible] high feed value when compared with [illegible] alfalfa hay and potatoes. No wonder cattle, horses, sheep and small boys eat honey locust pods.

"The six prize-winning entries came from Maryland, [illegible], Pennsylvania, Virginia and North Carolina. [illegible] in another contest. [illegible] and the [illegible] trees."

* * *

[illegible] honey locust [illegible] result of a [illegible] contest held in [illegible]. The original [illegible] sugar content of [illegible] percent. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The average yield of the Calhoun variety in 1952 produced an average of [illegible] pounds of pods per [illegible] acre. In the estimates of 1,200 pounds per acre for stems per acre, the four highest yielding trees in the experiment averaged [illegible] feet average and [illegible] inches in trunk diameter. These produced an average of [illegible] pounds of pods or the equivalent of [illegible] pounds per acre.

The 4-year-old trees of the Hilleson variety in 1952 produced an average of [illegible] pounds of pods per tree (dry weight basis), which at [illegible] trees per acre yield the equivalent of [illegible] pounds of pods. The four highest-yielding trees averaged [illegible] feet in height and [illegible] inches in trunk diameter, and produced an average of [illegible] pounds of pods or [illegible] pounds per acre.

Preliminary feeding tests with baby chicks for 2 weeks, using [illegible] Japan Island pods as a part of the concentrate mixture, have been conducted in cooperation with the Dairy Department. These tests show that the pulpy Japan Island pods are an satisfactorily substitute for oats round for pounds in the concentrate mixture, and that the pulpy material is very palatable to the chicks. Samples of the pods of the Hilleson and Calhoun varieties collected at Auburn, Alabama in 1951 and 1952, gave the following average analyses (on weight basis):

Variety	Invert sugar, %	Sucrose, %	Total sugar, %
Hilleson	[illegible]	[illegible]	[illegible]
Calhoun	[illegible]	[illegible]	[illegible]

A data analysis analysis (average of three composite samples of Japan Island pods, collected at random from high-yielding trees in Alabama as determined by the Alabama Feeds Control Laboratory, gave the following results: moisture, [illegible] per cent; ash, [illegible] per cent; crude protein, [illegible] per cent; crude fat, [illegible] per cent; crude fiber, [illegible] per cent; nitrogen-free extract (including crude fiber), [illegible] per cent.

The estimated yield of [illegible] pounds per acre dried pods from four trees among 5 years old was a feed value equivalent to [illegible] pounds of oats or [illegible] bushels of oats.

J. C. Brown, superintendent of cooperative [illegible] research, Alabama Agricultural Experiment Station, submitted the following as part of the annual report on cooperative research experiments:

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

"We hope to begin grazing the winter annuals in January, use the pastures for the summer grazing crop and finish the cattle for the market on home-grown feed during October and December."

10%

[illegible]

[illegible]

Indicator	No. items [illegible]	Scaled	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Colleges	30	100%	[illegible]
Citizens	[illegible]	100%	[illegible]

[illegible]

Indicator	No. items [illegible]	Scaled	[illegible]
Williams homogeneous	10	100%	[illegible]
Smith homogeneous	[illegible]	100%	[illegible]
Johnson homogeneous	[illegible]	100%	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

* * *

OHIO

The annual office reports on project work submitted by O. O. Ohlen, supervisor of cooperative silviculture research at the Ohio Agricultural Experiment Station, furnish the following information.

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] on September [illegible]. The varieties were Yellow, Sycamore, Hilton, TVA [illegible] and TVA [illegible]. The soil is medium [illegible] of [illegible] with lime, [illegible] and [illegible] [illegible] soil and a highly [illegible], [illegible] [illegible]. The [illegible] a layer of [illegible] when the trees were planted, and this layer [illegible] with the [illegible]. Accordingly, in the spring of 1940, the land for 8 feet on each side of the tree-rows was plowed and [illegible] into low, broad terraces. This treatment aided the growth of the hemlocks and by the end of 1941 they had reached an average height of nearly 7 feet. Crop production began in 1943 and totaled only 6 pounds of nuts from 37 trees. No records on the crop borne by these trees have been made since 1947. But it is known production has been very light. Growth measurements made in [illegible] 1947 are as follows:

Survival and Growth of 5 Hemlinnut Varieties at Reliance, [illegible]

Variety	No. planted: 1938	Survival	Ht. Av.	Ht. Ex.	Ht. Cv.
			Gain as of March 1947		
Hilton	87	[illegible]	1.09	6.40	
TVA #1	98	[illegible]	1.77	4.19	
Hillsboro	58	[illegible]	1.77	4.14	
TVA #3	40	100	2.34	10.46	
Sycamore	13	100	2.35	13.02	

* * *

NEW AND PROMISING TREES FOR TVA AND OTHERS. Hemlinnut is one of several species being studied in the Forest Tree Crop project of the Authority, in its effort to discover and develop tree crops of special value for landowners. The possibility of the use of honey locust as a crop tree in soil-conserving tree management practices has been of interest to the Department of Forestry Relations since 1939. At present 27 trees selected are under observation; two of these are of particular interest since they are practically thornless and produce pods with a sugar content of [illegible] and [illegible] respectively. Scouting for additional select trees of outstanding value is being continued.

The sun bear seedlings of honey locust are being propagated in considerable numbers by budding and grafting methods for experimental use in interior basin site requirements, groundcovers, orchard rootstocks and, etc. However, a much less expensive method of propagation is becoming available through the use of root cuttings. The application to the production of plant has also made the building up of a supply of cut-rooted clones in the nursery. Also, studies are being made each year during the dormant period to obtain information on the winter behavior and utilization requirements of the species in general, but of the honeylocust in particular.

"The nutritional value of the honey locust is based on the fact that [illegible] from honey-producing activities. It is important to [illegible] the food value of this seed in the feeding of livestock, and it is likely that [illegible] conducting such tests. However, a [illegible] of the food value of common honey locust seeds in the ration of [illegible] is now under way at the University of Tennessee Experiment Station. Comparisons of analysis of common seed and [illegible] seed-producing trees, when related to the results of these feeding tests, will serve to give the best information attainable on relative nutritive palatability and nutritive value of the honey locust pods. Comparison for these and other experimental tests, including the possible beneficial effects of varied locust pods on foreign conversion in ruminants, are being arranged for in cooperation with the State Agricultural Experiment Stations in Virginia and North Carolina." --(The Forest Log, TVA, Feb. 1939)

* * *

"An investigation on the forage value of honey locust pods through livestock feeding tests was commenced in cooperation with the Tennessee Agricultural Experiment Station. This investigation indicated that the value of common honey locust pods was about 80 percent as effective as an equal weight of ground corn pod meal, and therefore too low for use in cattle fattening rations. It was noted further that higher quality pods must be fed for successful results, and pointed to the possibility of using lower lower pods in maintenance rations.

"It was also found that the external appearance of a pod is a good indication of its quality and that chemical analysis is necessary. The results of preliminary work indicate that it may be possible to produce thornless honey locust trees by natural selection of the seedlings." --(The Forest Log, TVA, Sept. 1940)

* * *

A letter from J. Russell Reed, published in the Proceedings, [illegible] Annual Meeting, Am. Soc Hortic Sci., 1937, reports that the TVA experiment stations had disposed of 3 selections of honeylocust whose pods yield were then 30% sugar, the [illegible] being 50% of sugar by weight. V. G. Schreiner hybridized honeylocust selections and saw hybrid produced 2 pods in the best year in one growing season, indicating early bearing-habit.

* * *

"It may be of some interest that I succeeded in crossing this year [illegible] Trinacantha with G. triacanthos this year, securing 32 seeds from 4 hybrid fruit. Gleditsia is the only one of the related genera [illegible] which blooms before Trinacantha here. All others bloom if so it is much later than Trinacantha." --(Letter of Nov. 6, 1944, from Geo. Mitchell, 10 E. 40th St., New York, N. Y. to SCS)

* * *

[illegible] We [illegible] of [illegible] for the [illegible] honey locust [illegible] by the [illegible] of the [illegible]. [illegible] Allegheny Forest Experiment Station [illegible] in Philadelphia. He grafted [illegible] professional [illegible].

The [illegible] both the Millwood and Calhoun, [illegible] which [illegible] in a [illegible]. [illegible] with a high sugar content and [illegible].

We'll [illegible]. [illegible] of [illegible], W. Va. [illegible] we have [illegible] acres of [illegible]. It'll be a lot of fun to watch the seedlings grow.

"In addition to eating honey locust we learned that both the Millwood and the Calhoun have perfect flowers. This [illegible] they are self-fertile, but possibly self-sterile. [illegible] flowers and [illegible] them." --(John W. Hershey, Progress Report for Fall 1946, Nut Tree Nurseries, Downingtown, Pa.)

* * *

"A honey locust tree with very [illegible] pods is growing in the yard of the fire house in Statesville, North Carolina. Nearby and [illegible] in and around Statesville are many honey locust trees, so that this tree offers a fine chance for selecting trees with [illegible], high-carbohydrate content pods." --(Data file [illegible] by [illegible], Nov. [illegible].)

* * *

FEEDING TEST: [illegible] HONEY-LOCUST [illegible]. Honeylocust fruits (pods and beans), ground into meal, were tested by the Alabama Agricultural Experiment Station as part of the cattle feeding [illegible]. The [illegible] annual Station report ([illegible]) states: "These tests show that ground honey locust pods may be satisfactorily substituted for [illegible] for cattle on the [illegible], and that the ground material is very palatable. ...Analysis (average of 3 composite samples) of honeylocust pods, collected at random from high-yielding trees in Alabama, as determined by the Alabama [illegible] Chemical Laboratory, gave the following results: moisture [illegible]; crude fat [illegible]; crude fiber [illegible]; [illegible] (including crude fiber) [illegible]. The [illegible] yield of [illegible] pounds per acre which came from trees only [illegible] years of age had a food value equivalent to [illegible] bushels of oats or [illegible] bushels of corn."

The Eastern Shell Committee has collected as far possible the [illegible] Testing Data. [illegible] and are looking [illegible] conditions. The [illegible] may take the [illegible] [illegible] the digestible coefficients of [illegible] [illegible] [illegible] [illegible] Harrison's "Feeds and Feeding" (10th ed., 1918). In the [illegible] [illegible] in Southern States. "There is scarcely sufficiency [illegible] for a feed, or ration, [illegible] the digestible coefficients of a similar feed [illegible] and that feed is [illegible] to be adequate." This question is considered far [illegible] digestible coefficients of composite feeds in calculating the [illegible] hemicellulose and lignin are similar to wood lignin; these [illegible] are slightly palatable to ruminants.

Digestibility Coefficients as Compiled in Florida

	Data, not including Pacific Coast states (No. of 10 items)	Composite Cases and pods (No. of 5 items)
Protein	78%	70%
Fat	[illegible]	59%
Fiber	10%	56%
N-free extract	91%	81%

A total of 11 analyses of the composition of Hemicellulose feeds are given in references quoted elsewhere in this compilation of data, as follows:

Composition of Hemicellulose Feeds
(All available analyses)

Name of feed	No. of analyses	Dry matter %	Crude Protein %	Crude Fat %	Crude Fiber %	N.F.E. %	Ash %	Total Phosphorus (P2O5) %	Total Potassium (K2O) %
1. Ga. 1/ Large pods	1	90.00	3.44	0.90	13.31	67.39	2.11	57.19	[illegible]
* 1/ Dep. of stems	1	91.77	4.75	0.64	14.37	68.37	2.46	66.54	[illegible]
* 1/ Av.-sized pods	1	91.87	7.37	0.49	14.02	66.46	2.54	66.19	[illegible]
* 1/ Und. to large pods	1	90.95	6.93	0.90	15.44	64.70	2.54	64.51	[illegible]
* 1/ Thin pods	1	94.95	8.19	0.60	14.99	69.11	2.37	64.51	[illegible]
* 1/ Small pods	1	91.25	8.35	0.79	15.32	68.70	2.33	68.71	[illegible]
2. 2/ Grades on Hum grounds	2	90.30	11.40	1.20	14.92	61.70	1.70	54.57	[illegible]
Ala. 1/ Bin-stored-the stock	1	87.[illegible]	[illegible]	1.15	17.14	45.46	1.11	[illegible]	[illegible]
Av. Hemicellulose pods	11	91.14	[illegible]	1.11	14.55	62.8[illegible]	[illegible]	59.44	[illegible]
Av. Cake, cassava 4/	450	91.1	12.0	6.7	10.9	60.9	1.6	14.1	—
Av. Composite pods 4/	8	90.0	11.[illegible]	2.8	15.1	57.4	[illegible]	[illegible]	[illegible]

1/ Analyses by [illegible] Texas Station (see summary on data [illegible] [illegible] Ga.)
2/ Analyses by [illegible] Ala. Texas Station, pub. in [illegible] Ala., [illegible] [illegible], 1918 (p. 15)
3/ Data from page 1[illegible], Maryland's "Feeds and Feeding" (1[illegible] ed., 1[illegible])

[illegible]

In 1916, the writer had a conference with Dr. L. H. Pammel, then head of Animal Husbandry at the Ohio Station and now dean of the Iowa State College Veterinary School, Ames, Iowa. He had had considerable experience with Sorghum and Johnson grass. Dry weather had been favorable years of these grass were highly hazardous but he stated that if they were grazed regularly they would extend the fall pasturage season because they stooled out a lot when pastured too short and a little rain brought on the average fall rain. This information is reported here because it suggests a method that should be most beneficial particularly. —(Note by J. S. Cummins)

* * *

"In summarizing the present status of the investigation of the sweet sorghum, it may be well to repeat that studies are still in progress which are expected to give further information on the ultimate value of the crop as a producer of forage. However, it seems reasonable that the yot can be recommended for silage-utilizing regions where a high concentration of feed material is required. As yet last information leading the use of honey locust in maintenance rations than indicates appears more feasible, since the flowering of the yot coincides with the end of productive pasturage and the beginning of the winter rest period of the stock." —(L. F. Kline, Texas Crops for the Southwest Dairy, Amer. Jersey Cattle Club, Oct. 1941)

* * *

The following data were furnished by L. A. Tilly, who had worked as a student at the University of Louisville, Atlanta, Ga.: "I enclose a copy of analyses and notes from the Georgia Agri. Station Director in charge of feed control, with reference to analysis of a few honey locust samples picked up from several trees on the Lewis campus. Only the No. 1 item, on which the figure was made, you last fall, is really worth the least attention (for variable reasons). The analyses illustrate the variability found in honeybloom fruits. The full protein amount is probably overstated for, inasmuch as some of the fruits were not as ripe as some that the fine-fine. The protein content of small, full-seeded pods might run 10% or only 12%, give considerable item for the larger pods. A pod fine amount of around 1% seeds what was in question. I realize the analyses leaving them out are required and possible. —(Tilly, Tu. I might mention, incidental to the low protein content of the pods, specifically it is below that of corn. After reading Kline's Texas Crops, he has briefly the variable pods and are the "pods that are the precise nutrient in the general line of feed crops." —(Letter of Feb. 26, 1939, from L. A. Tilly, Atlanta, Ga. to J. S. Cummins, Ind.)

* * *

[illegible] information in your letter of Feb. 11, 1938 [illegible] Harrison. I also [illegible] to analyze I was [illegible] samples of honey because [illegible] results are given in the attached analysis [illegible] of analyses [illegible] of this report). You will note that there is no [illegible] molasses in the sample sent to profess, but that the results are not in agreement as average analysis from Harrison's 'Foods and Feeding'. While scientific there is either a difference in molasses or else the work conducted by Harrison was done very [illegible] by different methods or using different [illegible] we have checked our results closely, and with the allowance for difficulty in preparation of samples, we believe they are about correct. Particularly with this class of material I cannot reconcile myself to the fiber content of about 2% as reported by Harrison. (Harrison's letter, below, stated he attached to report, not [illegible]). The fiber content we show, especially around 1%, would seem more nearly correct.

'While we hope the information furnished will enable you to return your best stock for propagation, I do not think that the work we have done in this instance would, by any means, be conclusive. As I have stated, due to the poor consistency, a sample is very difficult to prepare and, therefore, an aliquot of less sample is difficult to obtain. Also, in my opinion the amount of the material (5 pods) on which working was too small, and at least a hundred or more analyses should be made before any logical conclusion should be drawn. However, I hope that for your purpose the information will be worth while.' —Letter of Feb. 10, 1938, from J. Templeton, Asst. State Chemist, Atlanta, Ga., to Prof. A. S. Rice, College of Agri., Athens, Ga., enclosed with Atlanta letter.

* * *

'A letter of Feb. 10, 1938 from J. Templeton Rice, Assistant State Chemist, to Prof. A. S. Rice, re samples of honeylocust pods submitted for analysis, refers to 'an average analysis' in Harrison's 'Foods and Feeding'. I am unable to find any such reference in the 20th edition of your book, and would appreciate such data as you can furnish us. The only nutritive references I can find in that of G. F. Nelson, USDA Bul. 108, which, together with Nicol. Analysis No. 12033, Ga. Plant Industry, is cited in Dr. J. Russell Smith in his 'Tree Crops', p. 102.' (Reference from letter of Feb. 21, 1938 from A. S. Rice, Athens, Ga., to Dr. F. G. Harrison, Albany, N. Y.)

* * *

'I am interested in your letter of Feb. 21 with reference to the possible use of honeylocust pods for livestock feeding. I know of no information concerning this matter, as referred to the reference given in your letter. The reference by Dr. Russell Smith, Texas Chemist, to analysis of honeylocust pods in Texas and feeding to livestock, to the average believe the cows have pots, not the horse have made. These hoofs are of course entirely different from honeylocuste, but the point here is that these pulled a factor - another confusing one if considerably to

[illegible]

[illegible]

[illegible]

1941, during which time [illegible] lbs. of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] lbs. [illegible] in the concentrate [illegible], [illegible] [illegible] [illegible] [illegible] [illegible] [illegible], one-half lespedeza [illegible] [illegible] [illegible] days following this transitional period, [illegible] [illegible] [illegible] through July 15, 1941, inclusive.

During a 16-day transitional period, July 16 to July 31, inclusive, both cows were fed no oats and all ground lespedeza hay in their grain mixture. This second transitional period was followed by a 31-day feeding period, Aug. 1-31, inclusive, on no oats and all lespedeza hay.

Period	Date	Days	Feed supplement in mixture	Lbs. milk	% B.F.	Lbs. F.C.M.	
			Cow [illegible]				
1	[illegible]	31	All Oats (no lespedeza hay)	[illegible]	[illegible]	[illegible]	[illegible]
Transition	[illegible]	14	Half Oats; Half lespedeza hay	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	31	Do.	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	31	Do.	[illegible]	[illegible]	[illegible]	[illegible]
Transition	7/16-7/31	16	All lespedeza hay (no oats)	[illegible]	[illegible]	[illegible]	[illegible]
4	8/1-8/31	31	Do.	[illegible]	[illegible]	[illegible]	5
			Cow [illegible]				
1	[illegible]	31	All Oats (no lespedeza hay)	[illegible]	[illegible]	[illegible]	[illegible]
Transition	[illegible]	14	Half Oats; Half lespedeza hay	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	31	Do.	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	31	Do.	[illegible]	[illegible]	[illegible]	[illegible]
Transition	7/16-7/31	16	All lespedeza hay (no oats)	[illegible]	[illegible]	[illegible]	[illegible]
4	8/1 - 8/31	31	Do.	[illegible]	[illegible]	[illegible]	[illegible]

Observations on the Feeding Trial.

1. Ground lespedeza hay appeared to be very palatable to the [illegible].
2. The [illegible] concentrate mixture appeared [illegible] to [illegible] laxative in its physiological effect on the animals.
3. Both mixtures of one-half lespedeza [illegible] and one-half oats and the mixture of no oats and all lespedeza hay [illegible] [illegible] laxative and [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] than the other.
4. The two cows produced during their second month of [illegible] on the usual concentrate mixture a total of [illegible] lbs. of milk and [illegible] lbs. of fat. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] one-half oats and one-half lespedeza hay, the cows produced [illegible] lbs. of milk and [illegible] lbs. of fat. This decline of [illegible] lbs. of milk and [illegible] lbs. of [illegible] [illegible] [illegible] [illegible] attributable to the concentrate mixture.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

*I [illegible] that a Longleaf Lion in Great Zoo[illegible] [illegible] [illegible] [

[illegible]

the pods from this tree [illegible] invert sugar, [illegible] sucrose, or a total of 29.6% sugar, dry weight basis." --(Letter of Oct. 22, 1943, from J. C. Moore, SCS, to E. Hume).

* * *

A honey locust tree about 40 years old was reported by T. S. Slick, a student at the College of Agriculture, Athens, Ga., in 1940. This tree grows on the campus, and has a stem 2" to 3" thk. In 1938 it yielded approximately 75 lbs. (75 lbs.) of pods; the 1939 crop was negligible. The pods were 3" to 16" long and 1" to 1½" wide. The "tree-dried" pods averaged 30 grams (1 oz.) in weight, the largest pod weighing 46 grams. In a letter of March 18, 1940 to E. E. Detwiler, Mr. Slick detailed the above data and wrote: "This tree bore but a few pods the past season. Although there could be a site factor, I rather fear the tree may naturally be a biennial bearer. I have observed other honey-locusts--a few on the campus and others outside of town--which bore crops in 1938. Some of these bore a fair crop in 1939; one or two had less than in 1938."

* * *

"In regard to the honeylocust, will say that the fruit of this tree is rarely injured by spring frosts and the result is we have a heavy crop every year." --(Letter of July 17, 1913 from C. C. Newman, Clemson, S. C. to J. R. Smith; published in Tree Crops, p. 66, 1929).

* * *

A honeylocust tree 4 inches in diameter was reported to the American Genetic Assn. in 1927 by Miss Nora Jenkins, R. 2, Brush Creek, Tenn. She stated: "The tree is very young but bore a heavy crop. A late freeze killed the entire locust crop this year."

* * *

"Honey locust is very intolerant of shade, and in favorable situations its annual height growth is from 1 to 2 feet, while its diameter increase often approaches ½", which is considerably greater than most forest trees. The tree produces seed abundantly and annual crops of beans are not uncommon." --(A. L. Bennett, Honey locust a tree crop, Penn State Farmer, May 1940).

* * *

"My observation has been that with many honey locust trees, the pods do not all fall in one short period of time but may continue to fall over a period of three or four months. There is one tree near Auburn on which I have made close observation for four years and pods began to fall from this tree in October and may continue until the latter part of December or the first of January. I believe it is generally agreed that fermentation and other chemical reactions are not so pronounced where the pods remain relatively dry; that is the less from chemical reactions

[illegible]

[illegible]

[illegible]

[illegible] the tree [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the ground.

[illegible] [illegible].

Collection of pods [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] into a [illegible]. [illegible] [illegible] [illegible] on the trees can be [illegible] [illegible] [illegible] [illegible] a light pole, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of the pole. [illegible] the pods [illegible] a [illegible], [illegible] [illegible] [illegible] the pods fall [illegible]. Some [illegible] [illegible] a pole fitted with a [illegible] [illegible] instead of a hook. This [illegible] has the shape and size of an ordinary [illegible] [illegible] [illegible], and in operation it is used to push upward on a branch and then allow the branch to [illegible] back sharply, loosening the pods. This type of [illegible] works well but it is advisable to have poles of several different lengths to reach to branches at varied heights on the tree.

A light tarpaulin spread under the tree, to catch the pods as they are shaken off, saves labor in picking up the pods. After collection and thorough drying, the pods are ground in a hammer mill, [illegible] for [illegible] [illegible], and stored for winter feed. It is not difficult to adjust the hammer mill so as to [illegible] the whole seeds from the pod [illegible] [illegible] [illegible] [illegible] of the [illegible]. This grinding [illegible] [illegible] [illegible] the [illegible] for [illegible] [illegible], and the bulk of the forage value [illegible] in the pod [illegible] [illegible] [illegible] [illegible].

[illegible] U. S. The results of these [illegible] were:

[illegible]

[illegible]

[illegible]

No.	Year	Sample from	[illegible]	[illegible]
1	1960	Gilliland [illegible], [illegible] (Fl), [illegible], Ala.	[illegible]	[illegible]
"	1961	do.	[illegible]	[illegible]
2	1960	Gilliland [illegible] (Fl), [illegible]	[illegible]	[illegible]
"	1961	do.	[illegible]	[illegible]
3	1961	Blount Co., Ala.	[illegible]	[illegible]
4	1959	Lexington No. 1 [illegible] Auburn, Ala.	[illegible]	[illegible]
"	1960	do.	[illegible]	[illegible]
	1960	1 wk. [illegible]	[illegible]	[illegible]
	1960	2 wk. [illegible]	[illegible]	[illegible]
	1960	1 [illegible]	[illegible]	[illegible]
	1960	[illegible]		
	1960	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Average sugar content of honeylocust pods [illegible] varieties, grown at Auburn, Ala. in 1946 and 1947. [illegible]

	[illegible]		
Variety	Invert sugar %	Sucrose %	Total sugars %
Millwood	7.55	29.30	36.85
Calhoun	5.49	30.37	[illegible]

* * *

"Tests with a Hand Sugar Refractometer for Estimating Sugar Content of Honey Locust Pods. (Conclusions) ...The results of these trials indicate that a reliable technique may be worked out for roughly estimating the sugar content of honeylocust pods with the hand refractometer. The results at the best are likely to be only approximate since the refractometer is not specific for sugar, and the total sugar content of a pod depends on more than the sugar concentration in a unit amount of pod material. The location of the sugar-filled tissues and its proportion in relation to sugar-poor tissues are factors that influence the total sugar content but cannot be determined by measuring a unit amount of pod material with the refractometer. While these sources of accuracy cannot be disregarded, it seems possible that they may be small enough to permit at least a rough approximation of sugar concentration with the hand refractometer. Tentatively the following method suggests itself as a good procedure for further trial:

"Cut 6 pods per tree. Punch out 15 discs from the center part of each pod, using a [illegible]-inch cork borer. Place the discs for each tree in a test tube and break them up with a rod. If the discs do not break into small pieces readily, shred them with a paring knife. Add 15 cc of hot water, [illegible] over the top of the [illegible], and [illegible] to the 15 [illegible]. At the end of 5 minutes, take a drop of the [illegible] and test it with the refractometer." [illegible] Expt. [illegible] Nov. [illegible], 1948.

* * *

"The [illegible] is [illegible] [illegible] of [illegible] and [illegible] against the [illegible] are [illegible] from [illegible] to color and [illegible]. In this stage of growth the pods [illegible] a sweet [illegible] [illegible]. The 'honey' mentioned in the name is not in the flowers but in the [illegible] pods." --W. E. Rogers, Tree Flowers, 1935.

* * *

DAMAGING AGENTS, INJURIES AND CONTROL

FROST DAMAGE; WINTER-KILLING. The parent trees from which horticultural selections have been made to date are growing in southern states, hence planting material of these selections tends to mature its growth later in the fall than do trees native to the North. W. L. [illegible] (Nebr. Sta. Report, 1905) tested the comparative winter-hardiness of honeylocust and walnut from seed obtained in southern versus northern locations. He reports that trees of southern origin did not fully ripen their wood when started out in

[illegible] the [illegible] are well matured in those of northern origin. In some [illegible] author's opinion, "resistance to cold in trees is due [illegible] almost wholly to the habit of early maturity rather than constitutional hardiness." Details of Lawson's study are as follows:

"Observations made in order to learn the amount of winter injury sustained by the trees from different states, and observations made the fall to determine their relative time of ripening, show that honey locust trees are no exception to the rule established for black walnut namely, that trees acclimated to the longer growing season of states to the south of us do not at once adapt themselves to our comparatively short season, but continue to grow late in fall and are consequently injured more or less seriously by our cold winters. The relative difference in time of ripening between honey locust trees from various states and the degree to which they are usually winter injured are seen from the following statement.

Table II. Relation of earliness to maturity in honey locust trees

State from which seed was obtained	Time of maturity	Amount of winter injury
Alabama	Very late	Badly injured
Kentucky	Late	Considerably injured
Kansas	Fairly early	Slightly injured
Ohio	Fairly early	Slightly injured
Nebraska	Early	Uninjured

Figure 10 shows the degree of ripeness of the new growth of Nebraska and Alabama trees on September 19, 1917. Although the trees from Nebraska had still held their leaves, the length growth of the twigs had been completed for the season and they were ripening preparatory to winter. The trees from Alabama were on the contrary, had not completed their growth but still showed most soft wood and very small, growing tips."

* * *

Preston and Bowman, "37 Years of Windbreak Planting on Dunes, Colorado" (Bul. 302, Colo. Sta., 1931) state: "During the early years, considerable suffered rather severe winter-killing, and heavy breakage by splitting was observed, but it appears [illegible] free from other forms of injury. This species has remarkable ability to sprout from the roots if killed back."

* * *

The unnumbered USDA bulletin, "Possibilities of Shelterbelt Planting in the Plains Region" (1936) states: "Late spring frosts prevent to injure undeveloped parts in internal and terminal growing regions. Damage of this sort was caused in at least one instance on the survey by a hard frost occurring early in May after bitter weather had set in. Black locust, honey-locust, and mulberry and black locust seems better resistant than the osage-orange."

* * *

[illegible]

* * *

[illegible]

* * *

[illegible] Thompson [illegible] "Injury and Death of [illegible]. Summary of Fires in Forests" [illegible] [illegible]. Vol. 14, No. 4, Oct. 1941] [illegible] [illegible] the ecological factors [illegible] [illegible]. The discussion presents specific data on the effects of the [illegible] on tree species. It includes the findings made by [illegible] and Thompson in their survey of lung-established [illegible] in the vicinity of [illegible], Ohio. This survey found that the after-effects of dropping [illegible] years later [illegible] as follows: red-cedar [illegible]; [illegible] [illegible]; sassafras [illegible]; pecan [illegible]; and black walnut [illegible]. "Lesseiting on wood [illegible] manifestly [illegible] in injuring or in causing the loss of [illegible] and [illegible] of [illegible]. Examination of the work of [illegible] in [illegible] (Kan.) by [illegible] samples of the trunk and large branches of different heights revealed that the number of [illegible] increased upward from the point that had recently died. They were present at a distance of several feet from the [illegible] dead wood." Other specific data on [illegible] are given, but the report summarizes the data only for the major species [illegible] [illegible] homeowner.

Additional references to dropping injury are given in the bibliography of this compilation beside "Heavy Equipment and Root Damage".

* * *

WIND AND LIGHTNING. "Here is my tabulation of the wind resistance of the ten more common shade trees are in the Northern Ohio Forest): 1) Pin Oak; 2) Red Oak; 3) Ginkgo; 4) American Elm; 5) European Small-Leaf Linden; 6) Plane; 7) Norway Maple; 8) Red Maple; 9) Sweet Gum; 10) Sugar Maple." --(F. C. Allen, Hurricane Damage, Proc. 1st Shade Tree Conf., 1939)

* * *

A survey was made of lightning-struck shade trees in [illegible] Chicago under the auspices of the National Shade Tree Conference. In the 2-year period 1936 to 1937, reports were received on 37 trees located in 7 states. The struck trees were of 9 species, pole curculios 30% of the total. [illegible] [illegible] was reported as being struck. --(Proc. 14th Nat. Shade Tree Conf., pp. [illegible], 1938.)

* * *

[illegible] "[illegible] [illegible] [illegible] [

[illegible]

[illegible] Pulvinaria vitis [illegible] attacks [illegible] the spring, when trees are [illegible] sulphate and [illegible] when the [illegible] Every [illegible] in which the greenish larvae are found. [illegible] yellow or orange. This pest is one of [illegible] Barnett, Flowers and Fruits of [illegible]

* * *

Cottony maple scale. -A native species distributed throughout the [illegible] most destructive in the world. [illegible] ...(3) maples, including [illegible] ...Control: apply the usual formula oil spray in [illegible] [illegible] Dr. Elias M. Ferris [illegible] (Which gives a good [illegible] culture. [illegible] There are many natural enemies, including [illegible] [illegible]

Black scale (Saissetia oleae). An unnamed species and [illegible] most important from an economic standpoint, causing an annual $2,000,000 loss to fruit growers in California alone. It is present in all citrus-growing regions of the world, but is not of importance in the Gulf States as in California. It is a pressure [illegible] as the nerve. [illegible] [illegible] are [illegible] and [illegible] of [illegible] [illegible] [illegible] are given.)

Greenhouse whitefly (Trialeurodes vaporariorum). The most common species on greenhouse and outdoor [illegible] [illegible] but most of the pests with [illegible] [illegible] of [illegible] and other [illegible] [illegible]

[illegible] [illegible] [illegible] [

[illegible] [illegible] [illegible] [

[illegible]

[illegible]

[illegible]

[illegible]

* * *

[illegible]

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[illegible]

* * *

[illegible]

* * *

[illegible]

[illegible]

[illegible] Disease of Honey Locust. - In Tennessee [illegible] was noticed in the first case of disease [illegible] in Honey Locust. Chemical Treatment. - On Three Acres [illegible] Locust trees were in Lexington, Ky. in Spring [illegible] years and from the road. The entering Rotary Lawn Mower [illegible] Locust trees lining five on the road, the last [illegible] distance.

The second example of Witches Broom Locust was found on [illegible] in Kentucky about eight miles from Covington, Ky. [illegible] Cincinnati.

"Subsequently, correspondence from John L. Sheldon stated that Mr. Sheldon had seen Witches broom Locust in the vicinity of Morgantown, West Virginia." (Grant & Hartley, Plant Disease Reporter, Dec. 15, 1938)

"Thyriocteria Disease of Honey Locust in the South. During a study of persimmon wilt in Tennessee and adjacent States the writer's attention was called to an apparently serious disease of honey locust (Gleditsia triacanthos). Often, on being given a description of the persimmon disease, farmers would state that they had seen it and that the same disease was also attacking their honey locust trees.

"The affected honey locust proved to be the victim of a canker disease of the bark of the smaller branches. The cankers range from the size of a pin head to a half inch in diameter. They eventually enlarge or coalesce and girdle the branch. The causal agent also penetrates the vascular system, producing reddish-brown streaking of the water wood for several inches in each direction from the visible canker. A gummy exudate also occurs on many of the cankers.

"In the Tennessee area these are occasionally killed by this disease, although as a rule of the infected trees [illegible] Trees in early stages of attack show branches with either

[illegible]

[illegible] Texas [illegible] [illegible] [illegible]

"Honeylocust [illegible]. The [illegible] wood. If [illegible] can be [illegible] to [illegible] the [illegible], and [illegible] as [illegible] value for [illegible], the use of this species should be accelerated. In a [illegible] planting in Region 8 this [illegible] has been [illegible]. At [illegible] because of [illegible] damage to [illegible] trees [illegible]."
—(L. W. [illegible]. Notes on [illegible] and Forest Planting in Region [illegible], [illegible] Page [illegible] (19[illegible])

* * *

"In Illinois, a [illegible] planting trees [illegible] honeylocust in [illegible] that where the [illegible] of the young trees [illegible]. The study further showed that the [illegible] trees must be [illegible] before they are [illegible]."
—(Report of the Chief of the Soil Conservation Service, 1946)

* * *

"The honeylocust [illegible] is an [illegible] from the [illegible] but [illegible] than to [illegible] it [illegible] animals it is desirable to [illegible] the trees after they reach a height of 8 or 10 feet. The [illegible] animals in the pasture will often [illegible] an unprotected tree by rubbing against it. Dr. (J. Russell) Smith recommends that two posts be placed in the ground, one on each side of the tree, and a strand or two of barbed wire be placed around the posts to discourage cattle and horses from injuring the tree. One important fact which Dr. Smith points out is that the honeylocust makes its contribution of pods in the fall at a time when the pasture is usually at its lowest production period." —(The Land Letter, Feb. 1947)

* * *

DAMAGE CAUSED BY HONEYLOCUST TREES

"Many other trees wage war with one another, the result in each case being the mutilation and alteration of the form of [illegible] of the trees. The Maple, for example, is [illegible] out [illegible] by the long thorny branches of a neighbouring Gleditschia (G. triacanthos) or else the [illegible] comes [illegible] to the [illegible] of the branches on the side facing the Gleditschia." —(Kerner and Oliver, The Natural History of Plants. 1902)

* * *

"In [illegible] plantings, considerable care should be given to the selection of species and the arrangement of these species in a [illegible]. In many of the [illegible] in [illegible], and [illegible], the cottonwood trees have been [illegible] in some instances have been killed if [illegible] or honey locust were planted on both sides of the cottonwood trees. It is not known whether this arrangement of species resulted in the death of the cottonwood. It is hoped that [illegible] will be able to make a [illegible] of the [illegible] in order to [illegible] future plantings in the [illegible]." —([illegible], [illegible], and [illegible], [illegible] 1951 [illegible])

* * *

[illegible]

* * *

"The Honey Locust [illegible]

There are many other [illegible]

* * *

[illegible]

* * *

"When I was [illegible] there was a [illegible] pasture adjoining the home farm, near [illegible] had a few honeylocust trees in one corner. About 15 years ago I observed that honeylocust seedlings were coming up all over this pasture. By 1937 these seedlings had obtained a height of from 4 to 10 feet and were very bushy. I would estimate that there were from 5 to 6 of these for every square rod. The owner of the pasture hired labor to cut and grub out these locusts, as he feared they would take the entire pasture." [illegible]

* * *

"The [illegible]

* * *

"Some of the small [illegible]

* * *

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

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[illegible]

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[illegible]

- - -

[illegible]

[illegible] the same purpose, [illegible] [illegible] Pres. [illegible] [illegible] occasions arising in the [illegible] of [illegible] [illegible] In the early stage the pods contain a [illegible] sweet only, but at any stage of ripeness they are [illegible] as they fall by plus of all ages. [illegible] at this institution in order that any symptoms of disturbance following consumption of the pods might be seen. So far nothing has occurred to show that these beans are not [illegible] and edible. ...An average sample of the beans was sent to the Department's chemist, Mr. F. T. Guthrie, F.I.C., who furnished the following analysis:

	Percent
Moisture	7.65
Albuminoids	13.82
Ether extract . . .	1.76
Fibre	17.03
Carbohydrates . . .	56.13
Ash	3.40
	100.00
Albuminoid ratio -	1 to 4.5
Nutritive value -	73.1

"In this connection the beans contrast favorably as feed with pollard, bran, coconut cake, linseed, maize, peas, and barley. —(H. V. Potts, The Honey Locust Tree—Pods, Shelled, are Good for Pigs, Agr. Gaz. of N. S. Wales, Feb. 2, 1920)

* * *

"The inside of the (honeylocust) pods are very sweet; children are very fond of them. The trees bear fruit very young and grow fast. They multiply very fast, especially on old gullies and land that is not cultivated. I notice that pigs are very fond of the fruit too. Other animals are, too; I have just noticed the pigs eat them around the house where there are some trees near.—(Letter of March 1, 1927, from Mrs. J. M. Wagoner, R. F. D. [illegible], Ky., to Amer. Genetic Assn.)

* * *

"In reply to your letter of June 1, 1945, I would state that I have about 95 grafted honeylocust trees on my farm. These trees are from 1 to 15 years old. About 15 of them had beans on them last fall. Six of these trees were really loaded down with a big crop of beans. So far we have not harvested any of the beans. I have about 70 head of sheep and they have so far been able to use the crop as it gradually starts dropping in the fall and continues to drop through the winter. I notice a few seedlings coming up in the pasture but I expect the sheep will keep them nipped off till they will eventually go to nothing. ...We have had exceptionally mild weather this past winter but several of the trees have been frozen back about 5 or 6 feet. I have they

[illegible]

[illegible]

* * *

[illegible]

* * *

"[illegible]

* * *

"The honeylocust (Gleditsia triacanthos), carob (Ceratonia siliqua), algaroba or mesquite (Prosopis chilensis), and the tropical tamarind (Tamarindus indica) are leguminous trees important as food for man and animals. Seeds of honeylocust have been found in the stomachs of the bobwhite, starling, gray squirrel and [illegible]

* * *

[illegible]

* * *

"G. triacanthos [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] honey locust may profitably be planted in belts [illegible] feet wide if retained to the age of 30 years. Green ash can about the same capacity for height growth and furnishes more protection. Neither of these species alone makes an efficient windbreak; they should be supplemented with conifers. About eight rows of these hardwoods [illegible] feet apart, should be planted at the outset, to be supplemented in a few years with three rows of Austrian pine on the north side." --(Bates, Bul. 86, For. Serv., USDA, 1911)

* * *

"Willows do not make good windbreaks for cultivated fields because their root-spread interferes with other growth. If a tree windbreak bordering a field is wanted, hardwoods such as green ash, Manitoba maple, honey locust and white birch are good for this purpose. Suitable softwoods are white spruce and cedar in Quebec and Ontario and red spruce in the Maritimes. All of these trees should be planted four feet apart in a single row." --(H. S. Richards, Farm Woodlots in Eastern Canada, Nat. For. Council Canada, 1[illegible])

* * *

"...What is going to happen in Salt River Valley if farmers continue to cut down trees and not replace them? Perhaps the removal of a few trees would not make much difference, but with the removal of about 99% of them, which is an estimate that has been made, large areas are being opened up that will be without wind protection.

"We have no pity for the cottonwoods and tamarisks that are being removed, because with their large, spreading root systems, they are extremely poor trees to plant in any irrigated area. There are, however, quite a few trees available for windbreak planting in Salt River Valley that do not have all of the objectionable qualities of the trees now being removed. All trees, of course, require water and soil in which to grow. If trees are planted adjacent to a field and crops are planted right up against the tree trunks there is sure to be a reduction in crop yield. Trees and crops usually cannot be grown successfully on the same piece of ground. ...

"Citrus and other fruits are often severely damaged by strong spring winds. Col. Dale Trueblood, whose orchards northwest of Phoenix are protected by windbreaks, reports that citrus fruit culling last season was 2[illegible]% and the average was 19% for the last three years. The entire citrus industry is reported to

[illegible] [illegible] [illegible] [

[illegible]

"Plants used to fight windbreaks in various conditions: [illegible] Brown, Pub. Department. Glaciation principal [illegible]; [illegible] in United States (Colorado) for windbreaks. [illegible] for [illegible] and bedding." —(S. T. 1. Monthly [illegible] Agr. Col. [illegible] Interest Dev. Agr., Ames, May [illegible])

* * *

"What kind of Trees Shall I Plant? Losses during recently [illegible] windbreak trees continue to cause concern among farmers and tree lovers throughout the state. In northern and eastern counties, particularly, the extremes of weather in the fall, winter, and spring of 1934-1935 have combined with severe disease and weed conditions to kill or seriously damage a great proportion of the most important species of trees. In that region such severe losses have occurred in Russian olive, cottonwood, Chinese elm, and ashes (most that they have been discarded by many.

"On the highlands of the northeastern part of the state, between the Minnesota, James, and Sioux River Valleys, in demonstration plantings, the only varieties surviving without fall and winter injury are the evergreens (Ponderosa pine, Colorado and Black Hills spruce, Douglas fir and cedar), the boxelder and a number of shrubs such as wild plum, chokecherry, buffaloberry, caragana, and [illegible] cherry. Yet the native woods contain thrifty, undamaged green ash, hackberry, American elm, basswood, cottonwood, and willow. That fact suggests that all these species should thrive, provided the seed source is composed of sound individual trees which are hardy under a similarly short growing season.

"Hardy seed important. In other words, one should be sure that his trees come from seed produced under just as severe growing conditions as his plantation must endure. For uplands of the northern part of South Dakota it should not be considered safe to use seed from the southern part of the state nor perhaps from especially well protected sites such as the interior of large towns. It is unquestionably true also that the Sand channel of the Missouri or its larger tributaries has a decidedly moderating effect on the climate of these valleys. Hackberry, honey locust, black walnut, Ohio buckeye, and other species do exceptionally well. Trees growing along the river bottom, terraces or cliffs or in gulches or on bluffs nearby may not be subject to such extremes of cold nor to such sudden freezes, giving the trees a better chance to mature their seed properly. These trees might not readily adapt themselves to extremely tough conditions. The same is true of the areas immediately surrounding Big Stone Lake and the Black Hills. Tree seed from the areas just described can be successfully used in the immediate vicinity or under similar conditions elsewhere. It is not out to be wholly satisfactory on the exposed uplands of the rest of the state.

[illegible]

[illegible] Lighting. [illegible] Here is more variation in the relative growth [illegible] of the seedlings. At least half of the stock equalled the [illegible] or Siberian elm in growth rate, but did not have the [illegible] susceptibility to winter injury. --(F. S. Rodwell, [illegible] Forester, South Dakota Farmer, June 1, 1937)

* * *

"A few years ago, Mr. Vinnie and Mr. Lie-Pen of the Eastern State College Agricultural Experiment Station made an interesting study of the maintenance of beef cows for cold protection. The effect of natural brush and tree shelter on winter feeding costs and stock gains was one of the factors studied. Their study showed conclusively that natural windbreaks are important in the feeding of livestock during the winter months. To quote them, "In this study two trials were conducted covering natural brush shelter in a creek bottom with an open feed lot provided with an open shed. In the first trial, conducted during a mild winter, the cows in the brush lot made 34.2 pounds more gain per head than those in the open feed lot. In the second trial, conducted during a severe winter, both groups of stock lost weight, but those in the brush lot lost 10.5 pounds less per head than those in the open feed lot. In each trial the stock received practically identical rations."

"Other studies made on the areas with established windbreaks have shown winter temperatures to be from two to six degrees higher on the lee side of tree windbreaks than in the open. It is also generally known that the body heat requirements of an animal exposed to winter winds increases rapidly with an increase in wind velocity.

"The type of windbreak planting for the protection of animals should consist of at least two rows of evergreens planted along the side of the greatest exposure. The north side is the best location for here the stock can take advantage of the winter sunshine and still be protected from cold winds. ....

"Providing Shade in Summer. Now aside from the winter benefits, trees have a decided value in providing shade for farm animals during the summer months. Milk cows and dairy animals suffer particularly from exposure to the sun. For this use cottonwood, ash, tamarack like Siberian elm, Black locust, honey locust, Russian olive, and green ash are of the greatest value.

[illegible] planted in [illegible] 70% [illegible]. [illegible] the honey locust are [illegible] very [illegible] [illegible]. Their crowns will not [illegible] enough shade to [illegible] the pasture but will provide adequate shade for the livestock. The seed pods of the honey locust are high in natural sugar and accepted as food by the stock. Experiments in the Kentucky bluegrass region have shown blue grass to become dormant and cease height growth when surface temperatures exceed 80 degrees F. The planting of locust at 25-foot intervals in the pasture has been shown to materially reduce the high surface temperatures.

"To plant and protect trees in the middle of a pasture is quite impractical in Utah. However, two or three rows of locust planted along the pasture edge would provide adequate shade to the dairy stock, and in addition help the pasture by reducing the velocity, and drying power of hot summer winds. A temporary fence will protect the young trees until they are of sufficient size to be out of danger from trampling. Irrigation is essential." --(R. Moore, Plant your windbreaks, Utah Farmer, March 25, 1947)

* * *

"Spacing and cultivation are the secrets of establishing trees on Idaho drylands. And dryland planting should be given clean cultivation. This is particularly true during the first four to six growing seasons. Spacing should, of course, vary with the rainfall. Recommendations range from plantings of 9 by 9 feet to as high as spacings of 12 feet apart both in the row and between the rows.

"The Extension Service has successfully established windbreaks in all areas of Idaho that support dry farms including those where the summer-fallow system is essential. Demonstration windbreaks are now established on the Camas prairie in Idaho county, the dry-lands in the vicinity of American Falls, and those in the higher areas of southeastern Idaho.

"Species most suited for dryland plantings are Siberian pea, Russian olive, Siberian elm, honeylocust, green ash, spruce and ponderosa pine. The Russian olive should not be planted in any of the ten northern Idaho counties because of a disease condition. The olive and the locust are not suitable at elevations above 5,500 feet. The pine is not suited to frosty bottom lands." --(V. F. Ravencroft, Windbreak growing on Idaho dry farms, The Furrow, Sept.-Oct. 1945)

* * *

"The field shelterbelt of the Plains states serves a multiplicity of purposes. Outstanding, of course, is its value in checking wind and in checking the soil erosion which is a direct result of that wind. This job it accomplishes more effectively than

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]			
	Lombardy Poplar (Populus nigra var. italica)			
	Eastern Cottonwood (Populus deltoides)			
	Bottomland Elm (Ulmus americana)			
	Shagbark Hickory (Carya ovata)			
	Black Walnut (Juglans nigra)			
6,7,8	Intermediate			
	Green Ash (Fraxinus pennsylvanica var. lanceolata)	x		
	Bur Oak (Quercus macrocarpa)	x	x	
	Hackberry (Celtis occidentalis) or var. crassifolia	x	x	
	American Elm (Ulmus americana)	x	x	
	Osage Orange (Toxylon pomiferum)		x	
	Catalpa (Catalpa speciosa)		x	
	Black Locust (Robinia pseudoacacia)		x	
7,8	Tall tree			
	Cottonwood (Populus sargentii)	x	x	
	Chinese Elm (Ulmus pumila)	x	x	
	Honeylocust (Gleditsia triacanthos)		x	
	Sycamore (Platanus occidentalis)		x	
9	Lower intermediate			
	Boxelder (Acer negundo)	x		
	Russian Mulberry (Morus alba tatarica)		x	
	Willow (Salix alba) or var. vitellina	x		
10	Shrub or Intermediate			
	Russian Olive (Elaeagnus angustifolia)	x		
	American Plum (Prunus americana)	x	x	
	Russian Mulberry (Morus alba tatarica)		x	

--(C. T. Haring, The "Shelterbelt"--8 years of progress, U. of Wash For. Club Quar., spring 1941-2)

* * *

NORTHERN, STREET AND SHADE PLANTING. "Honey Locust. This tree with its lacey, finely compound foliage, and its spreading graceful form, has much to commend it. It was in great favor a generation ago for hedges because of its large, sharp thorns, and many of the trees which are found today in cities and towns are individuals which have grown out of such neglected hedges. A medium to large-sized tree ((4-8) ft.), but occasionally on rich soils attains a height of 100 feet or more. Desire large lives and will thrive on any average well-drained soil but is not adapted to wet soils. It is generally free from insects and disease and stands the polluted atmosphere of cities well. Its light open foliage permits excellent growth of lawn beneath it and it is well adapted for use near buildings and gardens where dense shade is not desired. Will not thrive where it is shaded by buildings or other trees, but must have full sunlight. Should not be planted closer than [illegible] ft. intervals. The tree's only defects are its [illegible] thorns and the litter caused by the large and decorative fruit pods in the fall, which latter character makes it [illegible]

[illegible]

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[illegible]

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[illegible]

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[illegible]

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[illegible]

* * *

[illegible]

* * *

[illegible]

[illegible] rises the ground in dry soil and [illegible] [illegible] [illegible], are highly [illegible]. In playgrounds where children are apt to climb trees, only the [illegible] [illegible] should be planted. Some [illegible] are possible [illegible] [illegible] of the best trees, especially for the [illegible] [illegible]. Only varieties, however, is not readily available from [illegible]." —(Fiske, Entomologist of Trees and Ornamental Trees, 1911)

* * *

"Honeylocust: We are trying this species along some of the [illegible] boulevards. We believe it deserves better notice than it has had. It is medium-sized and light shade." —(Carl Hansen, Shade Tree Commissioner, Newark, N. J., p. 11, from 11th Ann. Shade Tree Conf., Aug. 1916)

* * *

A tabulation of the qualities of shade trees is contained in an article by L. Nussing in American Forests, Jan. 1945. Honeylocust is recommended where a small tree is needed to survive city atmosphere. Its virtues are stated as "[illegible], [illegible] and extra showy".

* * *

B. H. Hunter, landscape gardener, Fairmount Park, Philadelphia, recommends honeylocust as a tree with graceful branches that does well in city parks. —(p. 12, Proc. Nat. Shade Tree Conf., 1953)

* * *

WOOD. Only trees used in the manufacture of carriages and [illegible] ... J. Honeylocust. Gleditsia triacanthos L. This valuable, but not sufficiently appreciated tree, which, in some localities is also called Black locust, wood-workers often confounded with the Black or Yellow locust, Robinia pseudoacacia, Linn., which belongs to the same family.

The wood of this tree is heavy, hard, strong, coarse-grained, materially compact, durable, susceptible of a high polish; layers of annual growth strongly marked by many rows of open ducts, medullary rays numerous, conspicuous; color, bright, from or [illegible] the sapwood lighter; specific gravity 0.5740; and, 0.60, used for frame-parts and sills, bogie bolts, construction, etc.; it presents a good appearance, when dressed and treated with oil, as locally finished for course.

"I have in my collection of forest products a bole of the wood of this tree made about eighteen years ago, which served as a flagpole to Cincinnati for sixteen years, standing on the sidewalk on Central Avenue, near Everett street, day and night, winter and summer, exposed to rain and sunshine, to frost and all the vagaries of our climate, and yet it is as sound to-day as it was when first placed there." —(Adolph Lenz, Ohio and Ind. Chair Forestry Sec., 1897. Prof. Lenz was one of the founders of the American Forestry Association)

* * *

"The wood of Black locust is sometimes confused with that of honeylocust, [illegible], and Texas honeylocust. These three species

[illegible] wood is quite similar, values in the genus Gleditsia are entirely different across from the Robinia. Honeylocust (G. triacanthos) has a limited commercial use, principally for fence posts and railroad ties, but is not the equal of black locust in strength or durability. Waterlocust (G. aquatica) and Texas honeylocust (G. texana) are little used commercially." —(F. H. Betts, Black Locust, Amer. Woods series, For. Serv., USDA, July, 1945)

* * *

"Heartwood of G. triacanthos is light reddish-brown or brown rather sharply demarcated from the thick yellowish sapwood. Luster rather high. Without distinctive odor or taste. Hard, heavy, tough, strong; sp. gr. (air-dry) 0.70 to 0.80; weight 48 to 52 lbs. per cu. ft.; texture moderately coarse, grain straight to irregular; not very easy to work, but finishing very smoothly; is fairly durable. Suitable for furniture, but the timber is too scarce to be of commercial value." —(Record & Hess, Timbers of the New World, 1943)

* * *

"Honeylocust wood: Sapwood yellowish, wide, heartwood light red to reddish-brown, wood without characteristic odor or taste. Very heavy (sp. gr. approx. 0.60), very hard, strong in bending, very strong in endwise compression, stiff, high in shock resistance, serve hard with tools, glues nails well but exhibits a tendency to split. Does not glue satisfactorily, shrinks little, durable when exposed in conditions favorable to decay. Used locally for fence posts and rails, general construction, furniture (the wood possesses many desirable qualities such as attractive figure and color, strength, and hardness but is little used because of its scarcity) interior trim, vehicles (especially for wagon wheels)" —(Brown & Panshin, Commercial Timbers of the U. S., 1940)

* * *

Honeylocust. Color of heartwood is cherry red; growth rings are conspicuous in plain-sawed lumber or rotary cut veneer; the figure in quarter-sawed lumber or quarter-sliced veneer is a distinct but not conspicuous growth-ring stripe. Weight of wood per cu. ft. when green is 61 lbs; specific gravity .60. Composite strength of honeylocust cross-tie is 133 (as compared with 161 for black locust, 100 for black walnut and red oak, and 40 for northern white cedar. (Bending, compression and shrinkage values of honeylocust wood also are given in tabular data). The decay resistance of honeylocust, white oak, dense Douglas fir, and dense southern yellow pine, based on service records is: "Heartwood of intermediate durability but nearly as durable as some of the species named in the high-durability group." —(Wood Handbook, Handbook bul., Forest Prod. Lab., USDA, 1935)

* * *

(Honeylocust) "Heartwood bright brown or red, sapwood yellowish, annual layers strongly marked, coarse-grained, medullary rays conspicuous, wood heavy, hard, strong, very durable in the soil. Used for fence posts, rails, wagon hubs, rough construction, etc.

[illegible] 2,910,000. [illegible] (On page 203 it is pointed out by Sugg that hickory has lower [illegible] in contrast to [illegible] hickory is black locust wood. "Thorns obstruct the passages through other wood [illegible] and thickened. Thorns also may interfere with the mechanical properties of plants.) —(Sugg, Wood and Other Organic Structural Materials, 1941)

Summary of Mechanical Data [illegible] Condition of Hickory

Condition: Specific gravity: [illegible]
Moisture content: [illegible]
Specific gravity: [illegible]
Specific gravity: [illegible]
Weight [illegible]
Shrinkage [illegible]
Radial shrinkage [illegible]
Tangential shrinkage [illegible]

—(From Table 1. The air seasoning and kiln drying of wood, 3d ed. by H. L. Henderson [1940])

"The perfect wood or heart of the Pecan bears nearly resembles that of the hickory, but its grain is coarser, and its pores more open. In these respects it is more strikingly characterized even than the wood of the Red Oak. When perfectly seasoned, it is extremely hard. It is little esteemed in Kentucky, where it is more employed, and consequently can be better appreciated than elsewhere. It is used neither by the carpenter nor the wheelwright: it is sometimes taken by the farmers for rails to fence their fields, but only when they are unable to obtain better wood. It is found by experience to be far inferior to the Wild Cherry and Black Walnut for cabinet-making. The only destination for which it appears to be peculiarly adapted is the forming of hedges, which its long thorns would render impenetrable." —(Michaux, North American Sylva, 1819)

"Uses. The bright, reddish-brown coarse-grained wood of the hickory is hard as well as strong, but it is very durable in contact with the soil. As a consequence, it is used quite extensively for fence posts and rails and for railroad ties. It also furnishes a fair grade of charcoal. Although the radial surface of the hickory shows a pleasing silver grain, the design is not sufficiently [illegible] to give the hickory appreciable value as a finishing material." —(Miller & Tobey, Trees of Illinois, Bul. Ill. Nat. Hist. Sur., [illegible])

"The test programs of wood seasoning by [illegible] conducted in the Forest Products Laboratory on actual service [illegible] and disadvantages [illegible] (Wood. Sci. Tech. Sub. Leaflet, [illegible])

<u>Durable</u>: includes practically all cedars, chestnut, southern cypress, junipers, black locust, red mulberry, Osage-orange, redwood, black walnut, and Pacific yew. <u>Intermediate</u>: Douglas fir, red gum, western larch, chestnut oak, southern yellow pine, and tamarack. Honeylocust, white oak, dense Douglas fir, and dense southern yellow pine are listed as intermediate but are nearly as durable as some of the species rated in the durable group." —(Boyce, Forest Pathology, 1956)

* * *

"<u>Distinguishing Characteristics</u> — <u>Gleditsia triacanthos</u> L.

<u>Pores</u>. Comparatively large in the springwood; conspicuous without a lens, forming a wide porous ring which occupies about one-half the total width of moderately wide annual rings. In the outer portion of the summerwood, very small, openings not clearly visible with an ordinary lens; joined in short, wavy, lighter-colored, tangential bands, distinct to the unaided eye. The large pores in the springwood are not clogged with tyloses but occasionally contain a bright reddish gum.

<u>Rays</u>. Mostly very distinct without a lens.

<u>Parenchyma</u>. Not noticeable around the larger pores and not readily distinguishable from the small pores in the summerwood.

<u>Annual rings</u>. Distinct; irregular in width and outline.

<u>Sapwood</u>. From 3/4 of an inch to 2 inches wide on the material.

<u>Heartwood</u>. Bright cherry red to reddish brown.

<u>Physical properties</u>. The wood is very heavy, fairly straight grained, and without characteristic odor or taste.

"<u>Similar Woods</u>. On account of the similarity in the color and general structure of the wood of the honey locust and the coffeetree, the two are often confused in the market. The coffeetree, however, has a narrower sapwood and a much larger pith. The pith in honey locust is usually less than 0.15 inch in diameter; in coffeetree it usually is over 0.2 inch in diameter. The pores in the outer summerwood of the coffeetree are somewhat larger (the openings being plainly visible with a good lens), and are very often in rounded groups which are not joined in tangential bands. The rays in coffeetree wood are less distinct to the unaided eye than those in honey locust. Scattered, small pin knots, due to the thorns which grow on the stems, are found in honey locust but absent in coffeetree." —(Koehler, Guidebook for the Identification of Woods Used for Ties and Timbers, USDA, For. Serv., 1917)

* * *

"Its (honeylocust) wood is heavy, a cu. ft. when seasoned, weighing 42 lbs.; strong and very durable and is used for fence-posts, ties, posts, and in the manufacture of agricultural implements." —(R. B. Hough, Handbook of Trees of Northern States and Canada East of Rocky Mts., 1907)

* * *

"The preference of [illegible] for fence posts, bridge ties, piles, [illegible] for freight cars and locomotives. The Pennsylvania Railroad, for instance, uses approximately one million cross ties a year. These come in several sizes. The present prices [illegible] Pennsylvania Railroad station loaded on the car are as follows: For ties sawed or hewed top and bottom only, 6" thick by 6" wide, 70 cents; 8" thick and 7" wide, 75 cents; 6" thick and 8" wide, 88 cents. For ties sawed or hewed top, bottom and sides, 7" thick and 8" wide, $1.05; 7" thick and 9" wide, [illegible]. The species acceptable under this classification are black locust, honey locust, red and white oak, and black walnut. If the ties are made of hard, [illegible] cherry, gum, hard maple, catalpa, etc., or sycamore, the price for each classification is somewhat higher. Since hardness, that still is a certainty, is the smallest number acceptable to any one order. All cross ties today are treated with preservatives which increase their life many times. Untreated ties normally last about 8 years, while treated ones have a use span of 25 years." --(B. G. Gaston, Pennsylvania markets for seed producers, Forest Service, September 1940)

* * *

The average value of fence posts in Kansas, Nebraska, Iowa and Minnesota is given as 16 cents for a 7-ft. post, 3 inches diameter at the small end. For the same class of post, cottonwood is valued at 10 cents; green ash, 16 cents; black locust, 22 cents; Osage orange 24 cents. --(For. Serv. Bul. 86, USDA, 1911)

* * *

Westveld and Peck (Forestry in Farm Management, 1941, p. 112) report honeylocust as being important for mine timbers and cross ties, in a select list of "important hardwood species according to their utility for various products".

* * *

"Class 3--Woods, when dry, weighing between 3,500 and 4,000 pounds to the cord. Heating value of one cord equal to about 1,500 pounds of average coal.

Yellow oak	Yellow birch
Red or slippery elm	White ash
Pin oak	Red oak
Hard or sugar maple	White elm
Honey locust	Paper birch

--(O. F. Ruthrauff, Wood Fuel for Iowa, U. S. Fuel Adm., 1919)

* * *

"Table 6. Heat values of firewood, based on Hodges interpolated weights. ... Honeylocust (U. triacanthos) [illegible] available heat units per cord of 80 solid cubic feet, [illegible] 500,000 B.t.u. when air-dry, [illegible] 500,000 B.t.u. when green. Percent of ash: [illegible] air-dry, 9[illegible]; green, 6[illegible]. --(Bul. 153, USDA, 1914)

* * *

[illegible]

[illegible]

[illegible]

L. E. Harris, Univ. of Okla. School of Pharmacy, reported on the chemistry of the fruit of G. triacanthos in the Jour. Amer. Pharm. Assn. 19: 117-9, Feb. 1930. Fifty pounds of pods were collected from two small trees on the campus from which 1500 gm. of seeds were obtained. Alcohol extraction of the ground seeds yielded 3.15% of the weight of the seed, of a light brown oil having the following constants: S.V. 155.[illegible] I.V. (Hanus) [illegible]; [illegible] 25° [illegible]; Sp. gr. at 25° 0.9336. The article states that Lauterbach (Phil. Med. Times, 1876) reported the presence of an alkaloid in the seeds which he called gleditschine. (cf. U.S. Disp. 20, p. 1930)

* * *

The seeds of Gleditsia triacanthos yielded on extraction with ether a [illegible] yellow neutral oil, which has a faint odor but no taste. The seeds contained a saponin, a [illegible], and a lipase. The lipase of Gleditsia seeds is much less active than the castor seed lipase. —[illegible]

* * *

[illegible] summarizes previous pharmacological studies of G. triacanthos leaves and reports his own investigations. He concludes: "There appear to be two active constituents, [illegible] isolated by [illegible], and a second which has marked [illegible]." —Jour. Amer. Pharm. Assn. [illegible]

* * *

Gleditsia triacanthos L. — [illegible]

* * *

[illegible]

"Tannin-bearing [illegible] of the Sahara [illegible] [illegible] found in sand for [illegible] closely related to [illegible] are the Flacourtia [illegible]. Phoenix dactylifera are fluorescent, a property which has been employed for their detection in sand. Flowers have searched for hours daytime samples of sand for their fluorescent content. [illegible] Hainaut and Chevalier recovered at the end of Oleastrin [illegible] Zizyphus [illegible] [illegible] and [illegible] Zizyphus [illegible] Tamarix [illegible] and Rubiaceae [illegible]." —(C. R. Soc. Biol. Soc. [illegible])

* * *

"With 5% NaCl, as a polymer agent, the following strain of [illegible] and [illegible] were found for southern [illegible] (L.C. or [illegible]): ...Hemoyleucant (Q. [illegible]) [illegible] [illegible], [illegible], [illegible]. 35.8%." —(Chem. & Ceramics, Bulletin [illegible] of [illegible] and southern [illegible], Ind. Eng. Chem. 30: [illegible], 1938)

* * *

Geistel suggests that possibly seeds of Gleditsia triacanthos could be used as coffee substitute, since they were fed to mice and other animals without injury. —(O. Geistel, Coffee Substitutes, Zeitschr. Nahrungs u. Genussmittel 35: 278-7, 1918)

* * *

"The Gleditsia triacanthos or Pavier d'Amerique (American Bean Tree) is easily recognized by its branching thorns, sometimes reaching 20 centimeters in length, and by its large, flat pods, reddish brown, from 3 to 5 centimeters wide, 25 to 30 centimeters long, with sugary pulp--resembling a little the fruits of the carob tree in their structure.

"This tree, introduced in Algeria after the French occupation, has been planted in the most widely varied stations. A few well known specimens exist, surpassing 15 meters in height, in the Sahel (western Sahara) of Algeria. One can see a very fine specimen planted at Fort-National (at about 900 miles in altitude) close to some equally well-developed Robinia pseudacacia.

"The Bean Tree, native of North America, does not seem to be the tree of warm, dry stations that it is sometimes pointed out. Mardy, in particular, has written that the "White Locust and the American Bean Tree are two excellent species which grow very well in dry sites". The Bean Tree planted at Orleansville, not far from the road from Algiers to Oran, in spite of having been watered are not very vigorous in general and some have been observed [illegible] (decaying) at the tips. In Algeria the Bean Tree and the Locusts do not develop suitably except in sites of good quality siliceous and moist, in preference.

"If one examines the decaying Bean Trees, one notes on their trunks as well as at the base of their large branches--on the parts still sound--accumulations of gum around which their bark, which is still closed, transparent, and glues in place on the latter.

[illegible] — [illegible] [illegible] [illegible]

these pods for centuries if they were properly [illegible]
--(letter of Dec. 29, 1936, from G. A. Reynolds, 95 Simonds Road, Belmont, Mass., to A. E. Detwiler)

* * *

COMMON NAME BY REGIONS

Northeastern Region

NEW ENGLAND. "Hardy throughout New England, grows in any well-drained soil but prefers a deep, rich loam; transplants readily, grows rapidly, is long-lived, free from disease, and makes a picturesque object in ornamental plantations, but is objectionable in public places on account of the stiff spines, which are a source of danger to pedestrians, and also on account of the long straw-shaped pods, which litter the ground. Distribution:

Maine. Young trees in the southern sections said to have been produced from self-seen seed.
New Hampshire and Vermont. Introduced.
Massachusetts. Occasional.
Rhode Island. Introduced and fully at home.
Connecticut. Not reported." --(Dame and Brooks, Trees of New England, 1902)

* * *

MASSACHUSETTS. "On this campus (Amherst) honeylocust has never done exceptionally well. In fact, there are indications that it is not quite hardy here. The tree is very thorny and is sometimes used for hedges. It has been tested in the demonstration hedge garden, but the results would not commend themselves to most persons." --(Mass. Sta. Bul. 267, 1930)

* * *

"G. triacanthos, the sweet locust or honeylocust, is sometimes found in this State, growing well in rich soil in sheltered situations." --(Emerson, Trees and Shrubs of Massachusetts, 1875)

* * *

CONNECTICUT. "As the question of the naturalization of Gleditsia triacanthos L., the Honeylocust, in New England, appears to be a matter of some controversy, perhaps a few notes taken on its spread in this vicinity may be of interest. A few weeks ago I visited a section where trees of this species appear to be most numerous. From a row of eight or ten individuals planted by the roadside they have spread across the hills for about a mile. I counted 110 in all. To a certain extent they appear in what one might call colonies of from ten to thirty trees; in other places they are scattered, standing singly. A great many of the trees had been cut down but the stumps remained and were measured. They varied from two to twelve inches in diameter; some were even larger, one having reached a diameter of 16 inches. The species is very persistent, for when the trees are cut down a dozen or more sprouts spring up about the stump. In the region where they grow steep hills of gravel are interspersed with valleys of sandy loam and the trees stand mostly in the valleys.

Then the question naturally arose, how did these trees with [illegible] long heavy pods that can at best be blown only a few rods from the parent tree get to such a distance. This question I asked of the owner of the land and he immediately explained that cows are fond of pods with relish, in fact appeared rather fond of them. If his statement is correct it easily accounts for the widespread distribution of the species in this district." —(L. Andrews, Torreya 103-4, 1902)

* * *

NEW YORK. "Honeylocust—By preference a bottom-land species [illegible] its best development in deep moist soils along stream courses, but occupying a variety of sites in view south on moist mountain slopes. Propagates readily from seeds but requires plenty of light. Zones A, B, and C (including all Transition soil sites throughout New York up to about 2,000 feet excepting in general, the Adirondacks, but dominant over the Allegheny plateau region and the Catskills below the spruce-balsam zone). A valuable species of secondary value southward beyond the borders of the basin. ...This species is widely propagated as a hedge plant because of its vigorous growth and well-armed branches. It is especially free from fungal and insect enemies and is to be recommended as an ornamental tree." —(Brown, Trees of New York State, Tech. Pub. 15, N.Y. State Coll. of For., 1921)

* * *

"Honeylocust is apparently native only to the Lake region of New York and westward and southward, but is now well established in many sections of the State except the Adirondacks and the Catskills." —(Illick, Common Trees of New York, 1927)

* * *

"Gleditschia triacanthos, Linn. ..It is a very large, handsome, [illegible] tree, seldom attacked by insects, and quite hardy in our most Northern States. The wood is heavy, hard, and rather coarse-grained and valuable for many purposes. ...Said to be not quite hardy at Rochester, N. Y., but it is in my grounds, as I have one tree 20 years old, that has never been injured, even in the coldest winters." —(A. S. Fuller, Practical Forestry, 1889)

* * *

"Wm. Reid, of Elizabethtown, N. Y., who has been a very successful experimenter with hedge plants, considers the honey locust the best for farm hedges. After 20 years of trial he is satisfied that it is more easily kept, and better adapted for a farm fence, than any other that has yet been used. When properly cut, it looks as well as any deciduous plant - as I can myself testify from an inspection of his different hedges." —(John A. Warder, M.D., Hedges and Evergreens, 1858)

* * *

"The honeylocust is the latest of our trees to put forth its foliage. This is the only thing that can be said against it, and that is not always a disadvantage. It is a tall, graceful tree, free from insects, thus far unaffected by smoke or dust, and well entitled to a place along our streets and in our parks. Where a dense, cool shade is

[illegible] through which the sunlight [illegible] makes it desirable for lawns or places where plants or grass might suffer from too much shade." (The author's Dendroid grounds [illegible] shows that starting with a 3-inch ensiling honeylocust, red maple, pin oak, and horse chestnut attain a diameter of approximately [illegible] inches in 20 years.) --(W. T. Fox, Tree Planting on Streets and Highways, 1903)

* * *

Block 11 (area 15 acres) "Set out in 1923 is honeylocust, Kentucky coffeetree, Chinese elm, and Chinese locust. Interplanted with western yellow pine in 1925; rollers spots planted to white spruce in 1927, and other vacancies filled with Oriental chestnut in [illegible]. In 1930, the results were: 'This combination has been dominated by the western yellow pine and the white spruce. The hardwoods have generally failed.' --(R. E. Pritchard, Rept. on Exp. Plantings, Syracuse For. Exp. Sta., Bul. 147, N. Y. State Coll. For., 1941)

* * *

NEW JERSEY. "Honeylocust is very hardy, not particular about the soil in which it stands, and a fairly rapid grower." (It is listed among the best trees for city planting on average streets, 60 to 90 feet wide). --(Gaskill, Planting and Care of Shade Trees, 1912)

* * *

DELAWARE. Largest honeylocust reported in the United States was found at Broadkill Neck, Del., by William S. Taber, State Forester. Its circumference at 4½' was 13'5". --(Amer. Forests, Apr. 1941)

* * *

Among the native trees of Delaware, W. D. Sterritt lists honeylocust as "infrequent", and classes it with the "inferior commercial species" along with coffeetree, holly, persimmon, etc. --(Del. Sta. Bul. 82, 1908)

* * *

PENNSYLVANIA. "Originally limited almost entirely to the region west of the Alleghenies, honeylocust now is common as a planted or naturalized tree in the entire eastern portion of Pennsylvania." --(Bul. 11, Pa. Dept. For. & Waters, 1935)

* * *

"Honeylocust is by no means as exacting or capricious in regard to soil or location as the common locust, and is equally hardy. If the soil is deep it will grow on dry ground. If not crowded it will generally branch out low down, and instead of throwing up a single stem there will be several of them struggling for supremacy. Advantage has been taken of this tendency in planting it for hedges and fences. If cut back near the ground when young, it will throw up numerous branches, and if properly handled will form an almost impenetrable barrier, which is made more formidable by its thorns. It does not sprout from the roots unless they are wounded.

[illegible]

[illegible] "Scantily [illegible] — Rare or very local throughout the state; being most frequent in the Upper Austral District. Introduced from Europe." —(Shreve, Flora Isle of Maryland, 1910)

* * *

MAC[illegible] "Rather infrequent, along streams on both sides of the Tennessee, Allegheny." —(Fol. 5, W. Va. Geol. Survey, 1910)

* * *

"Not common in any part of West Virginia, but found in scattered stands throughout the state, except on high elevations. Persists best in fertile soil of river bottoms, but grows well in other situations. The wood is most principally for fencing, short lumber and general construction, but the tree is too rare and out of sufficient size to give it any commercial importance." —(W. Va. Bul. 175, 1930)

* * *

DISTRICT OF COLUMBIA "In the city of Washington there are a few streets planted with the honeylocust. They do not look as beautiful as those planted with other species. Besides, the honeylocust gives practically no shade at all. Its foliage is fine and delicate, and comes out very late in the season. ... Both the black locust and honeylocust are attacked by borers and caterpillars that cause great injury to them." —(Rehder, Trees in Towns and Cities, 1921)

* * *

Southeastern Region

GENERAL "Honeylocust is a rather small tree of moist places, ditch banks, etc., throughout the Southeast. It is said to be an introduced tree from west of the Alleghenies but it now has become thoroughly naturalized. Fruits: long, flat, many-seeded black pods up to 16 inches long, with a rather small amount of sweet edible pulp. These fruits are often mixed with persimmons to form what is known in the South as locust or persimmon beer. It is rarely planted as an ornamental, partly due to the large number of fruits and rather wicked thorns dangerous to children. However, a thornless form is known (Bull. Fla. Nat. Hort. 20: 30, 1932). Is named on the fruits, or here

[illegible]

[illegible]

[illegible]

On Dec. 19, 1794 Washington wrote Tobias Lear, his secretary, manager at Mt. Vernon: "I will estimate on proceeds and you may have Locust seed as I receive very resistable reasons may be made of them." Two weeks later, on Jan. 11, 1795, he wrote Pearce:

"I shall send you by the first Vessel at least a bushel and a half of clean honey locust seed which I could have gained in a scramble for the purpose of hedging. By an experiment I have made, a (large) quart contains 4,300 seed; this, allowing six seed to a foot, will cover an plant. Your row of lim seed seem' on this late, 'or quarts (which I mean you may count upon, at least) would require 1000 qts. The method I would have you prepare whenever you find most convenient, that the seed may be put in as soon as it arrives, the full part will be wanted for the rows, so as need the plants until the one fit to transplant is all that will be required." Many testimonies imply that Washington had prepared nurseries planting stock at Mount Vernon prior to 1795, perhaps using the seed received from Richard Henry Lee in 1787.

The President's distress as an absentee landowner failing in his efforts to get better fencing of his farms is voiced in his letter to Pearce of May 22, 1796, from Philadelphia: "It is much to be regretted, and I do regret exceedingly, that the honey locusts which have been set out, should have perished. It would seem I think as if I never should get forward in my plan of hedging. With respect to the transplanting of Cedar (or any other evergreen) I am persuaded there is no other sure way of getting them to live, than by taking them up in the winter with a block of frozen earth around the Roots (and as large as it can conveniently be obtained, proportioned to the size of the plant.) This not only gives them their mother earth, but by its adhesion to the principal roots, it nourishes the body until the fibres from the former shoot sufficiently to secure the vegitation and thriftiness of the plant. I transplanted thousands of Pine and Cedar without getting scarcely one to live until I adopted the above method; after which, so long as it was practiced, I never lost one. Witness the pine grove by the Gardens; both of which were planted in this manner, and to the best of my recollection not one of them died; whereas, out of the fifty planting, just as they now are, not more than two or three of them lived."

* * *

Another early Virginian, Robert Beverly, had an interest in honey locust and believed that better annual use of forest resources should be made. "The Woods produce great Varieties of Timber and Dyes, which distil from several Trees, as also Trees bearing Honey (honeysuckle-like), and Sugar, as before was mentioned. Yet there's no One sort of any of them, either for Profit or Ornament." Earlier in his interesting account of early life in Virginia he writes:

In the Eastern Parts of Wild Florida, [illegible] [illegible] [illegible]

[illegible] "[illegible]

* * *

FLORIDA. "Waterlocust, occurring in western Florida, differs from honeylocust in having short, narrow, [illegible] pods, and in attaining a height of [illegible] feet." --West and Arnold, Native Trees of Florida, [illegible])

* * *

"Honeylocust, [illegible] central and northern Florida. In addition to the common honeylocust (G. triacanthos) and water locust (G. aquatica), the former probably introduced and the latter native, the Chinese species Gleditsia delavayi Franchet, has shown its ability to [illegible]. The first two of the above species are little grown as ornamentals and as the last has not long been introduced, it is rarely seen. As an ornamental, the tree would be objectionable in many situations because of the numerous, long, branched, sharp spines on the trunk and branches." -- Fla. Sta. Bul. [illegible], [illegible])

* * *

GEORGIA. "Honeylocust, well known for its long pods, is scattered throughout the State. The wood is reddish brown, not as durable as black locust but is used successfully for fence posts, cross ties and hubs. The pods provide food for hogs." --(C. A. Whittle, Leading Woods of Georgia and Their Uses, 1929)

* * *

"Typical of old fields, ditch-banks and the borders of streams. [illegible] throughout the state except in the higher mountains." --[illegible], Native Trees of Georgia, [illegible])

* * *

ALABAMA "(Honeylocust) Distributed throughout the state in [illegible] [illegible]

* * *

Tabulated data in Monograph 8, Ala. Geol. Survey ([illegible]) indicates that honeylocust is sparsely distributed in the state, being mostly found in the Tennessee Valley, and mostly on calcareous soils.

* * *

MISSISSIPPI. "Gleditsia triacanthos is found throughout the State, probably most common on [illegible] in river bottoms. It is used for ties and posts and for lumber for cheap

[illegible]

[illegible] "Temporary shortage has between of [illegible] [illegible] [illegible]

"Some [illegible] [illegible] Honey Locust (Gleditsia triacanthos) and the Kentucky Coffee Tree (Gymnocladus) both long [illegible] and need not be gathered until they fall. The first is early ripened, the latter not until the [illegible] in the spring, when they can be trodden out and [illegible]. These seeds may be kept dry." —(John A. Warder, Tree Seeds—(Their) collection, preparation, preservation, planting, and culture, Sylvan Forest Tree Planter's Manual, 3d ed., 1857)

* * *

Hedges "Though a strong grower, and one that will require the most severe pruning to make it a hedge, and though almost every author and experimenter has condemned the honey locust as unfit for a hedge plant on the observations of it, as seen in the grounds and by the roadsides, have satisfied me that it is worthy of further trial as an occasional feature in hedges. Its easy propagation, its strong and rapid growth, its endurance of severe clipping, and its tendency, even when to produce a multitude of strong, shoot-jointed shoots, while the young plant is covered with terrible thorns that the defiance of age and [illegible]. Generally, the hedges that I have seen of this locust have failed from too close planting, by which most a large proportion of the young were smothered; and then from want of trimming, the result was very [illegible] a row of trees. I shall plant 3 feet apart, cause a public road, and trim severely, as often as may seem needful, until the main hedge is established; nor even allow a leader to grow a yard above the hedge-top, and by this course shall expect to have an impenetrable hedge in 2, or at most 3, years from planting. Every common will give us positive evidence in favor of this plant as an offset to the failures of unphilosophic experimenters, who denounced it as unworthy further trial because it would not make a hedge of its own free-will and accord, and in spite of their neglect." —(John A. Warder, M.D., Hedges and Evergreens, 1858)

* * *

Roadside, Street and Shade Planting. "The Honey Locust. As a park tree this is gaining ground rapidly. The native species (Gleditsia triacanthos) was a favorite with A. J. Downing (famous landscape architect), who says of it: 'There is a peculiar elegance about the light green and beautiful foliage which waits so gracefully in the summer breeze, and folds up on the slightest shower, that it stands far above the common locust for the embellishment of summer. It does not sprout like the black locust and is more like the species of California. It grows rapidly from seeds after sowing.'" —(J. Buck, Amer. Hort. Manual, pt. 1, 1911)

* * *

MICHIGAN "Honeylocust. Indigenous to the extreme southern portion of the state, but is planted as far north as Bay City. Grows rapidly and is long-lived and free from disease. Easily transplanted. The leaves appear late in the spring and fall early in autumn. The stiff spines and long pods which litter the ground make the tree unsuitable for street or ornamental use." —(Otis Mulliken, Trees, 1913)

"On Oct. 3, 1917, I observed a honey locust, 25 ft. tall, [illegible] from entire [illegible] Mich. This tree had a good [illegible] of [illegible]

[illegible] "[illegible] Honey Locust [illegible] Ohio [illegible] Ohio [illegible] Ohio

[illegible] fall in the winter. The house [illegible] and are disassociated with the manure.

"The lumber is heavy and durable, and, though coarse in fiber, [illegible] seems a good appearance, when dressed and treated with oil, [illegible] finish for houses.

"Gleditschia monosperma, Walter (Water Locust). A smaller tree with but one seed in a pod. Is eastern, but has been cultivated [illegible] —(Dr. John A. Warder, Sandy plants of Ohio, Ohio Agr. Rept. for [illegible]

* * *

"Dr. John A. Warder. Dr. Warder was born in Philadelphia, Jan. [illegible] In 1830 his parents moved to Springfield, Ohio. A few years later [illegible] returned to his native city, and entered upon the study of medicine. In 1837 he went to Cincinnati and began the practice of his profession. ...Dr. Warder was for years President of the Ohio Pomological Society, President of the American Pomology Association, which was [illegible] for seven years before the American Pomology Congress was organized [illegible] 1852), and, at the time of his death, Honorable President of the Ohio State Forestry Association. In 1850 he began publication of the Western Horticultural Review, which, in 1854, was consolidated with the Botanical Magazine. In 1853 he described the Catalpa speciosa, which is now recognized as a distinct species. In 1854 he purchased [illegible] hundred acres of the President Harrison farm at North Bend, and in [illegible] gave up the practice of medicine, and removed to his new home to spend the rest of his days. For more than a quarter of a century his home was, in fact, an experimental station in forestry, in fruit culture and in kindred subjects.

"Dr. Warder died at North Bend, July 14, 1883, and was buried at Spring Grove Cemetery (in Cincinnati, very beautifully landscaped), with which he was officially connected for years, and which, as director, he assisted in laying out and beautifying. Dr. Warder justly deserves the title given him of 'Father of American Forestry'. Especial attention is called to his published reports, addresses, and other papers on Forestry, a list of which would fill a page in this report." —(From John H. Peaslee, 1st Ann. Rept. Ohio State Forestry Bureau for 1887)

* * *

"Butler County. ...The lands known as 'bottom lands' on the Miami [illegible] are generally composed of sandy, alluvial deposit. The predominant timber upon these lands is Hackberry, Buckeye, Box Elder, Sycamore, Honey Locust, Walnut, and sometimes Sugar tree and Hickory." —(1st Ann. Rept. Ohio State For. Bureau for 1887)

* * *

"36. Gleditschia triacanthos Linnaeus. Honey Locust, Black Locust, Three-thorned Acacia, Sweet Locust, Honey Locust. Generally distributed, but attaining majestic proportions in the southern part of the state on low, rich bottom lands. It reaches a height of from 80 to 100 feet, exceptionally 150 feet, with a trunk from 3 to 4 feet in diameter. Tree hardy, hard, strong, coarse-grained, moderately heavy, durable, susceptible to a high polish. Layers of annual growth

[illegible] [illegible] [illegible] [

"The giant remnant has been one of the delights of [illegible]. In August [illegible] (1894) the same tree was again full of pods. At that time [illegible] young seedlings four and five inches high were found growing about the tree by the hundred, seeming to indicate that a dry season is favorable to young seedlings of this tree. On the east, south and east these seedlings were numerous within thirty feet of the tree. Beyond this they were few and scattering, except on the southeast, where they were found at considerable distances. Owing to the difficulty of finding the young seedlings in the grass, experiments were not undertaken." —(C. Walker, Proc. Ind. Acad. Sci., 1894-5)

* * *

ILLINOIS "Honeylocust thrives on moist and fertile soils. It ranges throughout Illinois, growing not only along streams and on bottomlands, where the largest and best trees are always found, but also on the uplands. Infrequently, it forms pure stands, whatever small areas, but it is usually a solitary tree. . . Dwight Ridgeway, who measured many of the large trees of the Wabash Valley before they were cut, gives the measurements of a honeylocust standing in 1871 as 120 feet in height, with 50 feet of clear trunk and a circumference of 17 feet." —(Miller and Tucom, Trees of Ill., Bul. Ill. Nat. Hist. Sur., 1949)

* * *

"The clay-gravel successions that are best known are those that take place on glacial deposits varying from almost pure clay to more or less complex mixtures of clay, gravel, and other materials. Opportunities for actually observing primary successions in the early stages are extremely rare. The best that are available for this purpose are the striplands of Illinois, Indiana, and Ohio where the vegetation has been completely destroyed in the process of coal-mining.

"The first woody plants are usually willow and cottonwood, but sometimes buttonbush and the soft maple, the white elm, the green ash, and the sycamore, come in almost as soon as the typically xeric pioneers. In any case they are sure to come sooner or later and are likely to be accompanied by honeylocust and such lianas as wild grape and poison ivy. The elm, sycamore, and honeylocust are commonly the dominant species of bottomland forest in this region and such a forest may become well established on stripland in 25 to 50 years after stripping. (p.224)

"In the case of some plants that grow in very dry places such as deserts, the root hairs become thick-walled and persist for several months or even years. This is true also of a few plants that grow where the water supply is abundant, such as the honeylocust, the Kentucky coffeetree, the redbud, and a number of species of the leguminosae family. It is probable that in all of these cases the habit of producing thick-walled root hairs was formed at a time when the plants concerned grew only in very dry situations." (p.15) —(Phillips, Plant Ecology, 1951)

* * *

"...The Honey locust appears to be much more common west of the Allegheny than in the Atlantic States. In the State of Illinois it is found principally upon the river bottoms, but frequently

[illegible] and is quite graceful, but the foliage is too like in appearance [illegible]. The pods, when ripe, contain a sweet pulp, and are [illegible] Interior patients, [illegible] to be called by the [illegible] the [illegible] of the Turkshell plantation, that they constituted the food of Pale-Face-Fighter.

Most of the Honey Locust trees which I have met with in Northern Illinois were descendants of Sharon. In some parts of the country they are nearly or quite all armed with them. This fact would seem to indicate the proper way of selecting seed for the different objects in planting. Seed for hedge plants should be gathered from thorny trees; that for ornamental or timber trees from seed as are unarmed. The seed of thornless trees will commonly, though not invariably, produce thornless plants, and it is reasonable that seeds from thorny trees will follow the same rule.

"The Honey Locust is directious; the greater part of the trees producing no seed. Young trees are easily raised by sowing the seed in the fall or spring. Some recommend scalding the seed before sowing. I have never found this necessary, and have found it to be destroyed by so doing." —L. Bryant, Trees for Shelter, Ornament and Profit, 1855.

* * *

"The Honey Locust (Gleditschia triacanthos), is another eastern tree with a range similar to the preceding species (Black Locust), and like it furnishes a hard and durable timber, that is coarser in grain however, and used chiefly for fencing and other exposed situations. Some trees are thornless. It has been planted in hedge-lines with good results where properly trimmed. The G. monosperma is a smaller plant, found in the southern part of your State and would doubtless thrive here if tried. The foliage and the one-seeded pods make it very ornamental." —Dr. John A. Warder, Forest Trees Hardy to Northern Illinois and adjoining regions, Trans. Ill. State Hort. Soc., 1881.

* * *

"L. H. Foster: If Farmers, in planting hedges, would drop Black walnuts along the rows at regular intervals these would grow and in time kill out the hedge, which is a nuisance anyway, and then they would make good live posts for stretching wire along, and in time make more.

Mr. Williams: The fact that this species kills out all other trees and plants near it is the very reason it should not be planted in rows; it should be planted in compact clusters where it may be allowed to occupy the entire ground.

Prof. Tapper: ...Black walnut trees readily from the seed, and the seed do not should be planted where it is desired the tree shall grow as the tree, once if very small, is quite difficult to transplant and make live. I object to this tree as a live fence-post, but would plant it in groves, and not string it around the farm or across the prairie, the age of it is this: that the Black walnut secrete a poisonous influence (for some reason to be ascertained) on all kinds of vegetation

[illegible] grove [illegible] a [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [

follows, of fuel. (35 cords per acre: ... Honey Locust - 35 Cords.

"...The Honey Locust, a very synonym for hardiness and health, deserves better treatment at our hands than it has received. It will hedge in Illinois either by dwarfing, or bale fencing, and it is such a luxury in this long and worm ridden country, to possess a No. 1 tree, which is bug and worm proof. ...The only tree productions we shall call attention to as sources of profit, are, first, the fruits, and second, sugar. Among the fruits there are few if any, which may not be improved into an increased usefulness. ...The Native plum and the Chickasaw plum, and that other Tennessee plum which the Botanies do not describe can be made to yield splendid returns to the horticultural exchequer, if the best-known varieties are chosen. The Persimmon is a hopeful object. The nut-bearing trees readily produced, may be made to yield their merchantable luxuries. Foremost in pecuniary interest, however, is the sugar product. ...The Honey Maple (Acer negundo) produces more sap than the Sugar Maple of equal size, half a gallon a day being obtained from a little tree of 3½ inches diameter and 5 years old. The sap is richer in sugar than the other; the yield of dry sugar averaging 2.8% of the weight of the sap. ...On many a farm there is waste land upon which taxes must be paid, and from which no sort of revenue is derived. Surely a good fuel or sugar-producing grove on such grounds is much to be wished for, and it may be had, too, for among the rocks is generally a good soil, and several kinds of trees seem to delight in such a location. ...

"We present herewith a list of deciduous trees and shrubs (77 species) ...This list gives the average girth in inches at 5, 10 and 15 years of age, of good healthy trees, also the height in feet at the same age, and the relative value for fuel, manufacturing woods, hedging, shelterbelt, decoration, and productions. ...The best fuel wood is Shagbark Hickory, graded 10, and the poorest Crack Willow, graded 1. The best manufacturing wood is White Oak, graded 10, and the poorest White Birch, graded 1. The best hedges, so far, Buckthorn and Maclura, graded 7 because they are not good enough, and the poorest, here mentioned, Grey Willow. The best shelter is Honey Maple and Lombardy Poplar graded 10, and the poorest Coffee nut, graded 1. The best decorative tree Norway Maple, Larch, etc. marked 10 and the shabbiest, Crack Willow, marked 1. The most useful trees on account of productiveness are Tennessee Plum, Honey Maple, and Chestnut marked 10, while many others are of no use in this respect.

"Honey Locust	-	Girth at 5 years			- 6 inches.		Ht. at 5 years			- [illegible] ft.
Do.	-	"	" 10	"	-13	"	"	" 10	"	- [illegible] "
Do.	-	"	" 15	"	-26	"	"	" 15	"	- [illegible] "

Do. - Value for fuel - 8; for manufactures - 8; for hedging - 7; for shelter - 8, for decoration - 6;" (No rated value for 'production' is given in the table). --(Henry McAfee, Report of the Committee on Arboriculture, Trans. Ill. State Hort. Soc., 1868)

IOWA. "Honeylocust is found throughout Iowa except in the extreme northwest corner. Primarily a tree of the upper flood plain but not abundant there, it occurs on a variety of sites and has extensively invaded old fields and pastures where allowed to do so." --(Iowa Ext. Circ. 246, 1938). "...On nearly all soils except dry uplands ridges." --(Bode and McDonald, Handbook of Native Trees of Iowa).

* * *

Table 1, Trees to Control Soil Erosion on Iowa Farms (Iowa Ext. Circ. 223, 1936) recommends propagating honeylocust from seeds treated for 2 hours with concentrated sulphuric acid or by collecting root sprouts, spacing of 8 feet in plantations; suitable for erosion control planting on dry or moist slopes; useful for posts and ties.

* * *

At the meeting of the Iowa Horticultural Society in 1878, an address on "Grouping in Forestry Plantations" was made by Dr. John A. Warder of North Bend, Ohio, founder and first president of the American Forestry Association, in part as follows:

"...In a natural wood, what species do we find growing best together? Some may be puzzled to answer so simple a question, and yet upon the answer to it may depend the success or failure of great undertakings in sylviculture. This much may be considered as settled: Among trees there are those which will prove positively obnoxious to each another. These are dis-associates. Others may be quite indifferent to their fellows of the sylvan family, or they may be acceptable neighbors to each other. These are consociates, and be happily grouped together. (Discussion follows of growth rates, size at maturity, and length of rotations).

"We know little yet from experience or accurate observation, yet let us take courage. 'Tis worth much if we even know that we don't know .. The field is too broad for a single man to cope with. Hence division of labor is required; and it is too long, that is, the investigation must be too long continued for any one life-time to complete the repeated observations needed to effect a solution of some of these problems. Yet we can go to work with courage. Iowa is a young State; she has a full corps of young men to emulate the noble deeds of their worthy sires. Induce them to walk in your footsteps in this matter of planting. Encourage them to plant their own trees, and thus early secure an interest in them, which may induce them to follow the father in the good work, and you may rest assured of ultimate success. ...

"Suggestions for Iowa. These are offered with great diffidence to men of intelligence and observation, and experience, too, in this art so new to Americans, by one who has already learned that valuable lesson, to which I have just referred, and who unfortunately

[illegible] idea and truth [illegible] [illegible] [illegible]

[illegible] is in [illegible] [illegible] [illegible]

[illegible] large ground area for most trees [illegible] able in the extreme Panhandle. ...If the proper protection can be secured by planting in the contour, this is certainly desirable if they are planted on a gentle land, plant on the rises instead of in the channel. There are times when it is ineffective to plant a windbreak on contour, but the more nearly the rows approach the better growth may be expected. All terraces within plantations should be maintained. Trees may be adjusted in the rows to permit such maintenance. If cultivation in a tree planting crosses a terrace, care should be taken not to cut furrows through it. Water diverted into the plantation from the eaves of buildings or from adjacent fields will result in increased growth of trees."

* * *

"Honeylocust: a fairly fast growing, open, rounded-crown tree that attains a large size. Its has peculiar, large, compound thorns. The seeds are formed in pods which make considerable litter when they fall in late autumn. It gives a good shade, is long-lived and thrives best on sandy and loamy soils. It seems well adapted to extreme western Oklahoma conditions. It is practically free from insect and disease attack." --(Pub. No. 5, Okla. For. Serv., Oct. 1937)

* * *

"The pines and cedars are well adapted for erosion control on sandy and sandy loam sites. Quick growing hardwoods, such as the Siberian elm, honeylocust, American elm and Russian mulberry are also well adapted to this type of service and may be planted on nearly any kind of soil." --(Pub. No. 6, Okla. For. Serv., March 1938)

* * *

"For street planting, thornless honeylocust is an erect, graceful, finely-textured tree; moderately rapid grower, and yet quite sturdy; attractive flowers and fruits; comparatively free of insect and disease troubles; very drought-resistant. Nature tree somewhat small for street tree, though excellent for lawn tree." --(Okla. Sta. Bul. Fr., 1934)

* * *

"The honeylocust is a tree that can withstand a wide range of soil and climatic conditions. It withstands the lack of abundant moisture over long periods of time." --(Bul. 61, Panhandle Exp. Sta., Goodwell, Okla., 1936)

* * *

LOUISIANA. "The Louisiana-French name for honeylocust is 'Piquant amourette'. It occurs in almost every part of this state, but is usually found growing in rather heavy rich soil. It is a large tree, often 100 feet in height, with a trunk 6 or 7 feet in diameter, sometimes much larger." --(Demon. Forest Trees of La.)

* * *

Nebraska (Exp. Sta. Serv. of U. and Agri. Co., 1941) reported honeylocust in Dates Range and East Dates Range.

* * *

"Honeylocust pods are eaten by many animals, and occasionally by children." --(La. Ext. Circ. 191, 1939)

* * *

TEXAS. "The honeylocust (Gleditsia triacanthos) is cross-pollinated with the black locust (Robinia pseudoacacia). Both species are so readily destroyed by borers, is unpopular in this region as a result few plantings of honeylocust have been made. It is a long-lived, fast-growing tree with light feathery, fern-like foliage. It puts out its leaves April 10 to 20 and drops them about the first of November. The white flowers which appear between April 20 and [illegible] lasting 10 to 15 days, present an unusually attractive sight and their sweet, fragrant odor permeates the atmosphere for a considerable distance. The stout, spreading branches with their foliage and the broad, rather loose head make it a graceful tree [illegible] limited shade. The dark-gray bark is a distinguishable characteristic. It is drouth-resistant, is able to withstand considerable alkali, is hardy to heat and cold, and has a strong running system.

"A number of five- to six-foot trees set out in 1918 (at the Uvalde Station) as a windbreak, spaced 20 feet apart, had attained by 1930 an average height of 25 feet and a diameter of 6 inches. By the end of the 1931 growing season they were 30 feet high, had a spread of 26 feet, and a diameter of 9.3 inches.

"Its disadvantages for lawn and avenue planting are the long, sharp spines and the litter caused from seed pods. However, spineless strains are available, and if the thornless forms are planted, the honeylocust can be recommended as one of the best and most hardy trees for this region (west Texas). It is worthy of much more extensive planting in the future. Small twigs are occasionally injured by the twig girdler, but otherwise this tree is comparatively free from damage by insects." --(Tex. Sta. Bul. 447, 1932)

* * *

Great Plains Region

GENERAL. "Honey locust (Gleditsia triacanthos Linn.) Since the introduction of honey locust from the northeastern States into the plains region of the West it has made a good record as a hardy, rapid-growing, general-purpose tree for wood-lot, street, or yard planting. It is drought resistant and is noted for its endurance of extremes of temperature, which makes it particularly valuable for planting in the northern region. It is suited to a variety of soils and may be planted very successfully on the dry upland areas. Some objection is made to its heavy thorns, but these may be pruned off easily. It may be readily pruned into a hedge, in which case the thorns may be desirable. Some nurserymen are now supplying a thornless variety which is declared to be equally hardy.

"The wood is more valuable for posts and fuel than for larger material. Without preservative treatment it is recommended for posts only in the drier soils. With cultivation it surpasses cheap growing until the crowns shade the ground, and it will produce fully as much material as the elm or hackberry." While I recommend 10 or 12 feet spacing for honeylocust and heavy loam soil as most suitable for this species. --(Advice to Forest Planters in the Plains Region, USDA F.B. 888, Oct. 1917)

"Honeylocust grows well and rapidly. Its wood is tough and strong and the heartwood is durable in contact with the soil and compares favorably with green ash, but is not equal in durability to white oak, black locust, or osage orange. The tree should be handled on a short rotation. Anyone with a more tolerant deep-rooted species is desirable, since honeylocust appears to lack any special ability for extending its roots in search of water. The tree does well on moderately dry uplands where the soil is heavy."

* * *

"The Honey Locust has a much greater western range than the Black Locust, and it possesses many qualities that should make it a general favorite. It has been extensively planted, but has been used to a limited extent only. Indeed, so far as I know, its only use, except for fuel, has been as post-timber. The wood is hard and takes on a beautiful polish, while in color and grain it is much more attractive than several fashionable cabinet woods.

"Repeated efforts to grow the Honey Locust at the Agricultural College of South Dakota failed. The young seedlings grew well the first year, but were killed, root and top, the first winter. In north-western Iowa, 25 miles northeast of Sioux City, there is a fine specimen of thornless Honey Locust and in the grounds of the Iowa Agricultural College is the handsomest thornless Honey Locust I have ever seen. Its trunk is about two feet in diameter, the crown is round and well developed, with a spread of branches of about 50 feet across, and altogether it is a tree of great beauty.

"Professor Niles Mason, of the Kansas Agricultural College, planted a quantity of seed of the thornless variety of the Honey Locust four years ago, and has a half-acre plat of trees from four to nine feet high. Not more than half the trees are free of thorns and there is every gradation from smooth to very thorny specimens. These thornless Honey Locusts cannot be too highly recommended for lawn planting. They give a light, though sufficient shade, and their finely divided foliage and long brown fruit-pods make them very attractive.

"On the dry uplands of western Kansas the Honey Locust is one of the most flourishing trees, as is proven by the fine growth of a plat of the species at Oakley, where it surpasses the Black Locust in size. At Hutchinson, in the moist soil of the Arkansas Valley, it also makes fine growth, thus proving its wide adaptability. Thrifty trees were seen in the suburbs of Lawrence, grown under irrigation. Honey Locust grows well throughout central and southern Nebraska. In an 8-year-old clump at Lincoln specimens 25 feet high were seen.

"A number of years ago the Honey Locust was extensively tried as a hedge-plant, but it does not lend itself well to this use. It is too vagrant a grower, and so among of lopping, cutting, and twisting and pruning can keep it within reasonable bounds." —W. A. Kaffer, Honey Locust in the West. Yearb. U. S. Dept. Agr. 1899, 199-200.

* * *

[illegible] as unreliable for windbreak planting in [illegible] Oklahoma, and [illegible] Texas. It is rated as very [illegible] well adapted to planting in South Dakota and as good in [illegible] and Kansas.

* * *

SOUTH DAKOTA. Honeylocust has been planted throughout the state but mostly in the southern part of the eastern half. It grows best on sand and sandy loam soils but does well on all bottomland soils and makes a moderate growth on upland sites. It is not considered exacting in soil moisture requirements. When planted in the northern and western part of the state, fair success has been obtained and a more general use of this tree is justified. Heights varying from 40 to 50 feet are attained on the more favorable sites and diameters reach 12 to 14 inches. On upland fine textured soils, sizes are considerably reduced. The honeylocust has a deep root system extending from 10 to 30 feet in the soil, and it develops a strong taproot. It is very wind-firm and is particularly free from insect and disease attacks. --(S.D. Ext. Circ. 356, 1936)

* * *

At the Dryland Station, Ardmore, S. D., a shelterbelt of Chinese elm, Russian olive and honeylocust was planted in 1925. A severe freeze in Sept. 1926, before the trees had ceased growth for the season, caused partial killing of the elm and Russian olive. Honeylocusts survived fairly well, but have been very poor trees for shelterbelt purposes. They have few branches near the ground and as a result, are valueless as snow catchers. This species should be planted in the interior or leeward rows. The use of the thornless variety is recommended for shelterbelts. --(U.S.D.A. Circ. 421, 1937)

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In S. D. Sta. Bul. 246 (1930) honeylocust is recommended only as a shade and lawn tree for limited planting in the southern part of the state.

* * *

In this state honeylocust is found native along the Sioux river in the southeastern corner of the state. The general experience with this valuable tree further north in the state is not satisfactory. --(S.D. Sta. Bul. 72, 1901)

* * *

"Trees to Plant. For strong hardwood for farm repairs, fence posts and fuel use Honey Locust with Hackberry, Green ash or American elm, alternated (6-12 feet apart) for insect resistance and better soil adaptation. ...Honey Locust, when planted in northern South Dakota, should come only from northern seed and be alternated with other species." --(F. L. Rockwell, Planting Windbreaks to Survive Drouth, S. D. Ext. Circ. 397, 1943)

* * *

NEBRASKA. Honeylocust is a very hardy species, can be grown anywhere in the State, and is not exacting in its moisture or soil requirements. These qualities make it especially desirable for western Nebraska planting. It is not bothered by the locust borer. --(Nebr. Ext. Circ. 1721, 1928)

* * *

[illegible] planting. [illegible] plantings [illegible] the first year after planting but these have been kept from the [illegible] and grew [illegible] 2 feet per year in height. —(Nebr. Sta. Bul. 137, 1913)

* * *

Honeylocust plantings at the North Platte Station, on the bench land and under irrigation, have done well. Table-land plantings made in 1907-8 have had heavy losses in the last few years but lasted much longer than elm and cottonwood in the same location. Trees left unpruned on table land have survived better but have not made as much height growth. They have made a good dryland windbreak. The honeylocust suckers easily if pruned high. Honeylocust is especially valuable in the southern and eastern parts in the North Platte region and in the more favorable sites farther north and west. Adapted to dryland and irrigation planting. —(Nebr. Sta. Bul. 310, 1937)

* * *

R. J. Pool (Bul. 7, Handbook of Nebr. Trees; Conserv. and Soil Surv., Univ. Nebr., 1910) states: "The Honeylocust is native to the forests of the Missouri river and its tributaries in southwestern Nebraska from whence it has moved up that river to the Niobrara and along that river to Cherry county. It is also found in the Republican river valley as far west as Garfield county.

"This tree grows rapidly, is a long-lived tree and is remarkably free from damaging pests. It is easily transplanted and quite readily adapts itself to a wide variation in environmental conditions. Occasionally one finds a specimen which is quite free from the long stiff thorns and such trees are excellent for street or lawn planting. Honeylocust is one of the hardiest of eastern trees which has reached Nebraska from the forests of New York, Michigan and Indiana. It is one of the most successful trees for planting in central and western Nebraska and is fast in almost all parts of the relatively arid Great Plains. The value of the seed as posts and poles should stimulate a wider utilization of this valuable species."

* * *

"The Honey Locust (Gleditschia triacanthos) is a large tree, possessing valuable qualities. Though almost unknown at the lumber yards. The wood is heavy and rather rugged, but makes good rails and timbers for construction; is quite durable but too coarse for ornamental architecture; fence posts last well and hold the wire securely; it is also used for posts, but they are not as durable as the true locust. It grows rapidly and seems well adapted to your soil. The thorns make it a valuable hedge plant, for which purpose it has been occasionally planted in your own state, and it occupies a prominent position in the rear hedge that line portions of the Burlington and Missouri railroad in Nebraska under the efficient supervision of President C. E. Perkins. Sq

By the way, [illegible] of growing [illegible] [illegible] ing some shortage high commendation, and if properly [illegible] the management, and protected from the depredation of [illegible] 25 miles already planted, will prove both a valuable [illegible] and a beautiful attraction along the line for all time." —(Geo. A. Vander, The Future Orchards and Forests of Nebraska, [illegible] of Univ. Neb., Dec., Sept. 1876)

* * *

Gleditsia triacanthos L. Sp. Pl. 1056 (1753). In nearly all publications the generic name is given as *Gleditschia* in spite of the fact that Linné spelled *Gleditsia*, evidently from Gleditsch. Named from the German Gleditzen. Southern, eastern, and northern counties from Sheridan to Nemaha, Douglas, Dixon, and Knox (Map No. 3). Successfully grown far beyond its natural range. Hardy in one of the desirable trees for planting on the plains. It is easy to propagate and may be transplanted without difficulty. —(Dr. Chas. E. Bessey, Hardy native forest trees of Nebraska. [illegible] Forester, Dec. 1891)

* * *

Larkin. "Honeylocust is a native tree in eastern Kansas and is adapted for planting in the western areas. The general rate in early life and early survival is usually good. The tree attains a large size under favorable conditions and succeeds under a wide range of soil conditions. Seed can be secured from trees that do not bear thorns, a greater portion of trees from this seed being thornless. The wood is relatively tough and does not break easily in strong winds." —(Kans. Sta. Circ. 116, 1940)

* * *

The honeylocust is another species that was used extensively in early plantings, but has lost its popularity because of the borer. Observations of early plantings of the honeylocust show that the greatest loss due to the borers is on sites where the trees have been neglected and are not making thrifty growth because of competition with weeds and grass. On favorable sites under clean cultivation this species will withstand a wide range of weather conditions and make a good growth. Its planting is recommended if it can be given good care. —(Kans. Sta. Bul. 27, 1938)

* * *

Circular 55, Kansas Station (Dec. 1916) recommends thornless honeylocust throughout Kansas for protective, ornamental and street planting. Description is rated as well adapted for heavy loam upland soil. Box elder and other short-lived trees in plantations should be mixed with honeylocust or other long-lived species, as replace the latter when they die. Results of heavy locust plantings in Kansas are reported thus:

Year	No. seed or plants	No. reported	No. living	percent
1910	3,611	2,140	984	70
1911	11,690	2,300	3,570	77
1914	1,495	500	395	79
1917	4,293	4,500	3,870	77

* * *

"The honey locust is a common tree, occurring in nearly all counties of this state. It grows naturally in the eastern half and has been planted in tissue-class plantings throughout the western half. It is one of the hardiest of our broad-leaved trees and is well adapted to all kinds of soils. Usually this tree is free from insect attacks. However, following a series of drought years the leaves have been attacked and seriously injured by borers.

"The wood of the honey locust is heavy, hard, coarse-grained, and quite durable in contact with the soil. Trunks of trees left lying on the ground to dry are usually attacked and almost destroyed by the larger borer (one of the flat-headed borers). The wood is of much value for fence posts and for fuel. The blossoms, though inconspicuous, are very fragrant and rich in nectar. The trees are frequented by great numbers of bees when in blossom. The name honey locust was given this tree because of the honeylike fluid that the seed pods contain.

"Because of the hardiness of this tree it should be used in all tree seed-lot plantings as well as in parks and on public grounds." —(C. A. Scott, Kans. State Bd. Agr. Rept., Apr.-June 1923.)

* * *

"Of all the species tested in many parts of western Kansas, the honey locust is the most conspicuous success.

"Its rate of growth is only moderate, but the rate is maintained for many years. A large proportion of the trees planted have built flat tops and they are strong in stem and branch, not often injured by ice or ice storms.

"At the Oakdale Station a considerable number of honey locusts have been planted in the older groves and along the roads, and where given good care the results are very satisfactory. Many of these trees have reached a height of 20 feet and a diameter of 7 inches in 15 years.

"In a demonstration block planted 18 years ago and neglected for a long a time that the buffalo sod had gained a secure foothold the honey locust has made a very creditable growth. The best trees have reached a height of 27 feet and a diameter of 6 inches. At Dodge City the honey locust trees have done very well indeed. Some few trees have been the victims of some over-zealous pruner. Either all the foliage that nature had provided to protect the trunks, has been cut, or he scalped the bark on the south and west sides of the trees. After the bark had been scalped severe frost conditions favorable for their development and a few trees of this species, usually fairly free from such injury, have been killed by the combination of too heavy pruning, sun-scald and borers. The greater number of the honey locust trees at Dodge City have made very satisfactory growth. The best trees are 75 feet high, and 23 inches in diameter. They are handsome, graceful trees, good specimens of this very desirable species." —(Kans. Fr. Bul. 150, March 1910)

* * *

"I refer to "Trees about Lawrence" by the late [illegible] in Transactions of the Kans. Hort. Soc. [illegible] Pick the sort whose one proposition of the soil, and after-culture, is pre-eminently to the point. Thorough cultivation here 'deep and fast on the disks' will make forest trees growing thriftily through sedge or cut sides when nothing else will. ...It is of much more importance than the selection of kinds, yet the latter is important--not all hardy variation will grow with this thorough cultivation. From my four years observation and experience here (Central Kansas), I would select, especially for the bottoms and uplands, Honey Locust, Speciosa (catalpa), Teas Hybrid Catalpa, and all the Poplars, in preference to the varieties named in Mr. Podgers' article." --(O. L. Myers, Ellsworth, Kans., in letter of June 13, 1883, to the Amer. Jour. of Forestry, July 1883)

* * *

MONTANA. Mont. Sta. Bul. 80 (1910) reports it not hardy at Bozeman but hardy at lower altitudes in the state.

* * *

WYOMING. At Sheridan field station, honeylocust, 5 to 6 feet tall, was bought from a commercial nursery in 1923 and planted in clumps with other species, spaced 6 to 12 feet apart. In the fall of 1928 the honeylocusts were 13 feet high, and practically no killing-back took place. --(Wyo. Sta. Bul. 163, 1929)

* * *

"Honey Locust (Gleditsia triacanthos): grown to some extent in Wyoming, especially in the eastern part of the state. It is worthy of continued use. The tree is being planted quite extensively in western Nebraska and Kansas and is drought-resistant. It is a slow-growing variety. It adapts itself to a variety of soils, and the wood is strong and durable and is useful for fence posts and poles. It is considered a good tree for the shelterbelt or as an individual tree in a lawn. Honey locust should not be planted at elevations above 5,500 feet." --(W. O. Simonsen, Wyo. Ext. Circ. 27, 2d ed., Feb. 1947)

* * *

Southwestern Region

GENERAL. On the Great Plains a pure short-grass cover indicates a condition of considerable runoff and of limited water-penetration, the available moisture usually being confined during the greater part of the season to the first 2 feet of soil. Such land is not at all adapted to deep-rooted crops unless the plants are grown far apart and with adequate intertillage. Wire-grass indicates land into which most of the rainfall penetrates. Because of the lighter texture of the soil, the water is distributed to a greater depth, and when drought threatens plants are able to draw on the reserve found in the lower layers of the soil. The native plant cover indicates a considerably longer growing season than on short-grass land, as well as a much more favorable condition for the production of deep-rooted plants. On bunch-grass land the soil texture is such as to insure the penetration of practically

[illegible] of the plants and [illegible] a [illegible] with available moisture and [illegible] growth. The native plants are such as require a very long season, growth and [illegible] favorable [illegible] [illegible] warm temps.

These timber claims are found in eastern Colorado, but far of them occur on short-grass land. Yet in some places trees have been [illegible] well on such land. On this hard type of land the most successful trees seem to be the ash and the hackberry, although some other species, especially the elm, hackberry, and honeylocust, do [illegible] fairly well. Successful tree claims are more numerous on mixed-grass land than on land of any other type. Among the species that succeed best are the elm, ash, coralbeat, black locust, and honeylocust. Trees of many kinds are commonly grown on mixed-grass land. The cottonwood, willow, Carolina poplar, silver maple, walnut, catalpa, ash, elm, coralbeat, honeylocust, black locust, cherry, apple, plum, Russian mulberry, etc., make a good growth on land of this type, and even on land marked by the most thin sand vegetation, and occasionally of the blow-out type of vegetation." —(E. L. Shantz, BPI Bul. 231, 1911)

* * *

COLORADO. Honeylocust should not be confused with black locust and is the one locust adapted to Colorado conditions. The fact that it is not exacting in soil or moisture requirement, endures extreme winters, and grows into an attractive medium-sized tree rather rapidly, are sufficient reasons for its extensive use. —(Colo. Ext. Bul. 385-A, 1937)

* * *

Honeylocust is listed among the first-choice species for planting on non-irrigated and irrigated land in eastern Colorado below 5500 feet elevation. "It adapts itself readily to practically all types of soil and is the most drought-resistant of our native broad-leaved species." —(Colo. Ext. Bul. 279-A, 1933)

* * *

E. G. Anderson, in an extract from a letter quoted in PCA Silvical Report of Region 6 (1937) states that some of 20-year-old honeylocust trees planted near Nelson, Colo., (alt. 5800 ft.) had good survival and averaged above 8 feet tall. The site is good and the trees were cultivated for the first 17 years. In a planting of 17 honeylocusts near Peyton, Colo., (alt. 5,700 ft.), only one tree was alive after 17 years, its height being 28 feet. Winter-killing of honeylocust was extensive in PCA plantings of honeylocust made in Colorado in 1936.

* * *

Windbreak planting experiments have been carried out on an extend Plains area near Akron, Colo. by the Cooperative Station in cooperation with the U.S.D.A. The first planting, in 1909, included honeylocust, but the major test (experiment 2) with this species was the 1910-12 planting. The trees in this test were spaced 4 x

[illegible]

Row 1 - Honey Locust	Row 5 - Hedge Locust
2 - American Elm	6 - Hackberry
3 - Russian Olive	7 - Black Locust
4 - Ponderosa Pine	8 - Black Locust

Row 9 - Black walnut and Black Locust

The soils in this experiment were Fluvent loam and Haplo Flav soil types, and are characteristic for most of eastern Colorado. There was no observable difference in tree growth or survival on these soil types. The following extracts are called from "57 Years of Windbreak Planting at Akron, Colorado" (Bul. Agr. Exp. Sta., 1961)

"The native vegetation is typical of the shortgrass zone, characteristically consisting of a mixture of the low-stature blue grama and buffalo grasses. Sage and other dryland shrubs occur with the grasses on the lighter soils.

"Precipitation is not only scanty but highly variable. Over the 57-year period of this study the average annual precipitation was 16.7 inches, considerably below what has been considered the minimum requirement for natural tree establishment. During this period the annual precipitation ranged from a low of 9.93 inches in 1934 to a high of 25.00 inches in 1915. The minimum figure is most certainly critical, trees having to be able to adapt their water economy to such low levels in order to survive. It was not uncommon for much of the precipitation to occur during heavy storms in which much a large amount of water was carried from the area as runoff. Approximately 4/5 of the annual precipitation falls during the half year April to September. This indicates that extreme drought exists during the dormant period.

"An attempt was made to get stock from nurseries having a climate similar to Akron. Unfortunately no records of seed sources are available.

"Windbreaks in the Central Great Plains need cultivation. Because of limited water supply it is essential that trees be protected from competing vegetation, especially during the early years. During the first 3 to 5 years of the experiment, cultivation was carried on intensively, the areas being disked, cultivated with a corn cultivator, and hoed 2 or 3 times a season. After the third to fifth year, as the trees became larger and shaded with heavy herbaceous cover, the amount of cultivation needed became less and a single yearly disking proved sufficient. The single disking was continued for about 15 years under the broadleaf species and for about 5 years under the conifers.

"In recent years downy chess (Bromus tectorum L.) has invaded the plantings, growing luxuriantly in open spaces and to some extent under closed canopies which can no longer be effectively cultivated

[illegible] [illegible] [illegible] [

"Honey locust is recommended for planting [illegible] rows or on protected sites. Apparently this species [illegible] stand either competition or severe exposure as well as [illegible] [illegible] Americans [illegible] honey locust trees planted along the margins of [illegible] [illegible] well, while those planted in [illegible] more rapid and successful. During its early years, honey locust suffered rather severe winter-killing, and heavy breakage and splitting was reported. But it appears quite free from other forms of injury. This species has remarkable ability to sprout from the roots if killed back.

"Conclusions and Summary.. Cottonwood, honey locust, Russian mulberry, Russian olive and Siberian elm are given qualified recommendations. Under certain conditions or for special purposes they have of definite value."

* * *

NEW MEXICO. Gleditsia triacanthos inermis. This tree is well adapted to Southwestern conditions, for it is hardy and quite drought resistant. It is very similar to common honey locust in its growth habits and soil requirements but is more desirable for home planting on account of being thornless. It grows to a moderate size, reaching an ultimate height of 75 feet. --(N. M. Sta. Bul. 284, 1941)

* * *

ARIZONA. With proper handling on the mesas, honeylocust requires but a small amount of irrigation, while in cultivated, alluvial soils it does fairly well without watering. --(Ariz. Sta., Hints for Farmers #83, 1910)

* * *

"Even on the lower mesas with limited irrigation and extreme heat it presents a thrifty appearance; while at Flagstaff it is quite as well as any deciduous species planted. The worst feature, that of undesirable spines, may be overcome by selecting spineless individuals from which seed may be collected. But all the seedlings come true to the spineless type: one should sow the seeds thinly in a drill, preferably in the fall, and pull out those the following summer which show a tendency to develop spines." --(Ariz. Sta., Hints for Farmers #79, 1909)

* * *

A table in Ariz. Sta. Bul. 76 (1916) shows successful growth of honeylocust at elevations of 150 to 7,000 feet above sea level.

* * *

UTAH. The honeylocust likes moisture and a rich soil, but will grow in most situations suitable for tree-planting in Utah. The honeylocust is not so rapid a grower as the black locust, but eventually becomes a larger tree and lives longer; its wood is not so valuable. Both this species and black locust should be severely pruned in transplanting. Honeylocust trees on the Station grounds (at Logan) have reached a height of 21½ feet and a circumference of 19 inches when 3 years old, (cultivated for 6 years, irrigated 4 years, spaced 5x9 feet). They resist the cold perfectly, and seem to be free from pests of any description. --(Utah Sta. Bul. 66, 1899)

* * *

[illegible]

[illegible]

"The thornless honey locust [illegible] and will grow in [illegible] of most soils as long as water is provided. It should not be planted [illegible] above 5000 feet elevation." --[illegible]

* * *

Pacific Region

OREGON. Among the selections of trees recommended by [illegible] for planting for various purposes on the Pacific Coast, Gleditsia triacanthos is listed as being alkali-tolerant, drought-tolerant, frost-tolerant, and pest-resistant. [illegible] "[illegible]" [illegible] It is listed as a rapid-growing deciduous tree and is among those recommended for [illegible] in "Pacific Coast Trees" by [illegible] (1946).

* * *

IDAHO. Honeylocust is hardy below 5,000 feet elevation in Idaho [illegible] and does well under irrigation, or with 20 inches or more annual rainfall. --(Ida. Ext. Leaflet 13, 1946)

* * *

WASHINGTON. Honeylocust has growth habits and soil requirements similar to the above locust. It requires 15 to 20 inches of rainfall per year and clean cultivation. Its principal uses have been mainly for shade or ornamental purposes, but it should be valuable as a windbreak and woodlot tree.

Table 1 lists honeylocust for planting for woodlots, for erosion control, for farmstead beautification, and for hedges, but not for shelterbelts and windbreaks.

Table 2 indicates honeylocust will grow without irrigation where annual rainfall is 15-20 inches or more.

Table 3 indicates honeylocust is subject to [illegible] damage [illegible] and is adapted for growth on [illegible] soils [illegible] --[illegible]

[illegible] "[illegible] [illegible] [illegible] [

[illegible] in [illegible] [illegible] [illegible]

[illegible] — [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [

[illegible] [illegible] [illegible] [

[illegible] "The [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

By E. G. Cheyney, American Silvics and Silviculture, 1947:

"Range. The honey locust is found from western New York south to Georgia and west to eastern South Dakota, thence south to Texas. It is most numerous in the rolling, gravelly hills of central Kentucky.

"Types and associates. It practically never grows in pure stands but is sometimes the predominant species. In the bottom lands of Illinois and Indiana it grows in mixture with hickory, elm, ash, boxelder, coffee tree, basswood, and walnut. In the prairie groves of Illinois it is found with oak, walnut, and others in their type.

"Soil. The honey locust is more or less of a failure on shallow soil and does not develop well on gravelly soils or heavy clay. It does best on deep, rich bottom lands. It prefers limy soil and does very well on the usual prairie soils.

"Moisture. This species is surpassed in drought resistance only by the Russian mulberry and the Osage orange. Only in the semiarid regions of the west is it confined to the moister soil along the streams. It will stand more severe climate than either of its drought-resistant rivals.

"Light. It is extremely intolerant.

"Seed production. The honey locust produces a plentiful crop of seeds almost annually. Although the seed is large and heavy, the twisted form of the pod makes it possible for the wind to roll it along the ground quite well. It is said to make very good cattle food. The seed should be sown in the fall or stratified for winter storage.

"Growth. This species often reaches a size of 2 to 3 feet by 75 to 100 feet, and occasionally grows much larger. On favorable sites it can be counted on to grow 1 or 2 feet a year in height, and from 1/3 to ½ inch in diameter. It will produce a seedling 1 foot high in the first year. Even on semiarid sites it makes a growth of 1 inch in diameter in 3 to 4 years.

"Management. The honey locust is one of the hardiest species for planting in the semiarid western regions, but for best results its planting should be restricted to Iowa, Nebraska, Missouri, Kansas, western Oklahoma, and Wyoming. Its low branches well fit it for use as hedgerow and windbreak. Before being planted, seeds should be soaked until they swell."

* * *

By Westveld and Peck, Forestry in Farm Management, 1941:

"Habits and Requirements of the More Important and Widely Distributed Tree Species in Farm Forests in the United States. (p.291)

Honeylocust. Soil requirements: Moist bottom-land loams best, but grows satisfactorily on relatively dry sites.
Competitive ability: Low.

"Natural regeneration: [illegible] reproduction.
Wind-firmness: Windfirm.
Insect susceptibility: Low.
Disease susceptibility: Low."

* * *

By John Arden Ferguson, Farm Forestry, 1916:

"The natural range of honey locust is from western New York and Pennsylvania south to Georgia and west to eastern South Dakota and Texas. It does not form pure stands, but is distributed throughout the hardwood forest. It grows to be a tree 140 feet in height and 6 feet in diameter, but usually is about 40 to 50 feet high and 1 to 2 feet in diameter. The growth is fairly rapid. On favorable sites it makes an annual height growth of 1 to 2 feet and an annual diameter growth of one-third to one-half inch a year. Under less favorable conditions it takes 7 to 8 years to grow an inch in diameter. It is intolerant of shade. It naturally produces large clusters of thorns along the trunk and branches, but these can be removed. There is a thornless variety of this species. Often in a grove of honey locust, individuals will be found without them. The seeds of these trees can be collected and grown. Those that produce seedlings with thorns can be thrown away and the thornless specimens planted. The wood is heavy, hard, strong and coarse grained, and fairly durable in contact with the ground. It is used chiefly for fuel, fence posts and poles. It is useful for hedges and windbreaks. The soils of the Plains and Prairie region are well adapted to this tree. It will withstand very dry conditions. It seeds abundantly and is easily propagated. The pods should be collected from the ground and the seeds removed and stored in a cool, dry place over winter, and treated with hot water before planting in the spring. The swollen seeds should be removed and planted at once and the operation repeated with the remainder. The seeds should be sown in moist, rich soil in the nursery and covered lightly. They will grow a foot high the first year and will be large enough to transplant to permanent situations the following spring. It should be planted closely together. Two by eight feet is recommended for Prairie regions. For shelter belts it should be planted 4 by 8 feet. It is often underplanted with a more tolerant species of tree. The honey locust is not so generally injured by the locust borer as is the black locust. It should prove a valuable tree to plant for fence posts in many regions."

* * *

By John W. Hershey, Plant America's Nut Heritage (America's Permanent Hill Farming). 1947. Pp. 20-21:

"Sweet Pods for Cattle Feed. Bears 3-5 years. Will grow 5 tons of fodder containing 1½ tons of cane sugar per acre. That, folks, is the same production as an acre of sugar cane, less cost of annual heart breaking, cultivation, harvesting. Plus an increased value of cattle pasture of 15% to 20% (by actual test) for having the trees on the pasture. Probably 15% annual soil building also. These large pithy pods that weigh as much as 17 to the pound, bone dry, contain:

"Cane Sugar	28 to 33%	Iron	0.73
Protein	10 to 13%	Copper	0.042

	Grs. per Lb.		
Ash (Total mineral)	179.	Vitamin A	- 0.8 units per lb
Phosphorus as P_2O_5	12.55	Vitamin B_1	- 165 units per lb
Calcium as CaO	7.70	Vitamin B_2 or G	- 962 Ug units per lb.
Magnesium as MgO	3.76		
Potassium as K_2O	[illegible]	Vitamin C	- 900 units per lb

"For the dry farm owner wishing to make the most out of his land with the least care here's your tree. I've set them on worn-out land in Tennessee and they grew and thrived. Set your pastures with these upper story forage producers.

"I've seen them grow in semi-arid and bearing with only 10 inches of rainfall in Colorado.

"Extension foresters of Kansas write me this spring and only withstood the sandstorms--and product of Kansas prohibition, but also competes well with the buffalo grass.

"We have one tree planted either 1937 or '38. You know the dry years we had. The year it was planted--a 10 ft. tree among June last it didn't rain all summer. In spite of its size it lived, it grew, it bore and bore more. In 1944 we gathered 125 lbs. till the worm came, with probably 3 lbs. still clinging to the tree. Twice a day my draft horses got the value of a handful of these delicious cookies (pods) and two Irish ears of corn (nubbins). We kept fat and sleek. Saved grain for 13 to 14 weeks. Tex was to the same with a large herd of these trees also.

"Just as we go to press Joseph C. Moore, Soil Conservation Service at Auburn, Ala., reports the following February 3, 1947: "Early Lattests of Millwood, sugar content 36.65%, Calhoun, 38.98%. Auburn's animal husbandry men found their pods equal to oats pound for pound in a dairy ration. A team of mules fed for 30 days on pods showed satisfactory results. Cows and hogs showed equal success.

"Bearing. At 5 years of age Millwood averages 5% pounds, Calhoun 75 pounds. At 8 years. Millwood 200 pounds. Calhoun 60.

"Pods fall October 15th to December 30th. Tree interplanted to Lespedeza sericea cuts 2½ tons per acre annually.

"Varieties. Found while in the TVA tree crop work. Calhoun - Northeast Alabama. Millwood - Eastern North Carolina. Both hardy to central Pennsylvania, Massachusetts, southern Michigan

"In 1946 Robert Schafer of Reading, Pa., sent me to a tree northward of Reading, Pa. This tree, standing hundreds of miles north of the above varieties, we believe will be hardy to Canada. Pods appear equal in size and flavor to Millwood.

"Now get this straight. Good varieties of honey locust, just like other tree crops, come only in grafted varieties. Do not write in for seed to get a cheap start because you like these varieties. It can't be done.

"Height : 75 to 80 feet. Spread: 30 to 35 feet.
Distance to Plant: 40 to 50 feet, 28 and 17 per acre.
Ornamental Value: One of the best. The Calhoun variety has the vase-like aspect of the dear old American elm. I often say, "it'll take the place of the elm when the Dutch elm disease cleans out the elm. The Millwood is more upright grower. Wood tough, seldom blowing over or splitting. The one great attraction is their fine feathery foliage.

"Range: Just discussed. Soil: Any type. See above.
Pollination: Don't know, we know they are male and female trees but everywhere they're planted they seem to bear.

"America's triplet sisters of production, of forage, protein, cane sugar, drug store vitamins and a source of plastics are the Oak, Honey Locust, and Persimmon.

"Plants for semi-wet Places: Honey locust...
Plants for dry soils leaning to poor, worn-out lands: ...Honey Locust, water until established.

* * *

By E. E. M. Loock: Three Useful Leguminous Fodder Trees, Farming in South Africa, Jan. 1947:

"In a country like South Africa where large areas are frequently stricken by drought and feeding presents a considerable problem, farmers should undertake more extensive plantings of one or more of the undermentioned important tree species, for their pods, which are of very high nutritive value. In the dry areas where the cultivation of annual fodder plants is a very precarious project unless it can be done under irrigation, the trees should receive special attention.

"Mesquite or Prosopis Tree. The mesquite (Prosopis juliflora) of the United States and Mexico, and Prosopis chilensis of Chile and the Argentine are probably among the most important fodder trees imported into South Africa. As far as is known, the former was imported by the botanist Karel Dinter during 1897 and the first tree was planted in the experimental garden at Okahandja. Subsequently, it was planted in many other parts and to-day it is found practically throughout the country. In some parts of South-west Africa and in the districts of Carnarvon and Britstown the tree has already become naturalized and is spreading under natural conditions, the chief agent being animals which eat the pods and scatter the undigested seeds.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

"The true proof of climate was time of year, which was be predicted by the long leaves. In the best development, however, it produces a large, handsome tree, like that found along streams, but it also grows well on clay, lime and loam soils. Because the plant has been a long-lived (sometimes as long as eight feet) it possesses not shadow.

"Propagation. Seedlings can easily be propagated from seed. The pods on any shadbry tree must be picked to remove the seed. Germination of the seed is accelerated by soaking the seeds in very hot water and for about 24 hours allowing the water to cool. One lb. of seed should yield from 2,000 to 3,000 plants.

"Because the young plant develops a long taproot as early in its life, it is better to set the seed directly in well-prepared soil immediately after the first good rains. The plants can also be grown in line in a nursery for planting out later in the rainy season. Deer and other animals are fond of the young trees, which must, therefore, be protected till their crowns are out of reach.

"Since the tree is planted mainly for its pods, the plants should be spaced 20 feet apart in order to give each tree sufficient space for the various developments of its crown. The larger the crown, the larger the crop that can be expected. Under very favourable conditions the tree will start bearing true its fourth or fifth year and from its tenth year it can be expected to yield 300 lb. of pods.

"Honey Locust" or Gleditsia Tree. (Gleditsia triacanthos). As the name of this tree implies, the pods, which grow to a length of as much as 18 inches, also contain sugar, which probably enhances the value of the pods as fodder.

"Gleditsia is a fairly large deciduous tree with or without thorns according to the variety. Its country of origin is America, but the tree is now found in many parts of the Union as an ornamental, shade or fodder tree. Owing to its adaptability and resistance to frost and drought it can be successfully grown practically everywhere. Since the tree is inclined to put out suckers, it may also be planted in rangas for the control of soil erosion.

"Nutritional Value. Since this species yields pods with a high per-

average of sugar and other constituents [illegible]. It should be planted primarily as a fodder tree. It is also very adventitious as an ornamental tree or a fore and will provide the necessary shade for which [illegible] the hot summer months. The pod yield differs from tree to tree and it is, therefore, desirable to produce high-production trees by budding or grafting.

"The wood is heavy, strong and fairly durable in the soil and can be used as fuel and poles on the barren flats of certain parts of the country. The small, greenish-white flowers, borne in small racemes are rich in nectar and will increase the honey yield considerably. Even the leaves which drop during autumn when other green stuff is so scarce, are eagerly eaten by animals.

"Climatic and Soil Requirements. Gleditsia is one of the hardiest fodder trees known. It is resistant to frost, cold and fairly severe droughts and can be planted in almost any part.

"It grows in all types of soil, but does best in deep, sandy, loam soils, like those found along rivers.

"Propagation. Gleditsia can easily be grown from seed. The pods are brittle and the seeds can readily be removed from the fleshy part. Before the seed is sown, however, it should be soaked in boiling water, as is the case of Prosopis, and then planted in a nursery or in a permanent site.

"The tree grows fairly fast and under favourable conditions will bear from the fourth or fifth year. At Middleburg, C.P., there is a tree which yielded an average of 300 lb. of dried pods between the ages of 7 and 12 years. The spacing is the same as for Prosopis.

"Carob or Locust Bean. (Ceratonia siliqua). Carob comes from Syria and the northern coasts of Africa, but has now become naturalized in all the hotter parts of the world. There are frequent references to this tree in the Bible, since it was well known in both Syria and Judea. It is claimed that the honey and locusts on which John the Baptist lived in the desert, actually were the pods of this tree, but the literal interpretation of the terms is probably more acceptable. The Prodigal Son is also alleged, in his wanderings, to have lived on these pods, which in those days were fed to the pigs.

"The geographical spread of this tree was initiated by the ancient Greeks who introduced it into Italy and by the Arabs who brought it to Spain and Morocco. To-day it is found in all the hotter countries of the world.

"As far as is known, the first seed was imported into the Union from England during the year 1870 and distributed amongst farmers, with the request that they be sown in the desired permanent sites because it is a difficult tree to transplant. Trees from this seed were

successfully grown in the district of Albany (now Grahamstown). Later, when the importance of this species of tree was recognised in other districts, care was taken to introduce and re-stock the tree is found in many parts of the country.

"It is a medium-sized evergreen and is ornamental. It is famous for the pods which are produced in large quantities and highly valued for their nutritional properties. The species is dioecious, i.e. certain trees bear only staminate flowers, others only pistillate flowers, while others bear hermaphrodite flowers. For this reason trees should be planted in groups of ten or more, otherwise pollination may not take place.

"Nutritional Value. The carob is grown mainly for the pods which have been used as stock feed overseas for hundreds of years. In certain regions it is also used to a small extent as food for the poor in times of scarcity.

"Because the ripe pods contain a high percentage of sugar and other digestible materials, it is regarded as a very valuable feed for pigs, sheep, cattle, horses, etc. The pods can be fed as such to pigs, but for other animals they must be mixed with hay, grass or oats, after having been crushed with a hammermill.

"In other countries the pods are also used for the distilling of alcohol. A hundred pounds of properly treated pods yield about 4 to 5 gallons of alcohol.

"Climatic and Soil Requirements. The tree grows best in a warm climate, but with some protection against frost and cold during the first few winters, it can even be planted in fairly cold areas. It thrives excellently in the coastal areas, but also grows well in parts of the Transvaal where the winters are not too severe. It is, however, not proof against the severe frost of, for instance, the Transvaal highveld. The tree can be planted on any type of soil, provided it is not too wet, but for the best development a deep, porous and well-drained sweet soil is most suitable. Owing to the early development of a very long tap-root it has a high resistance to drought.

"Propagation. Trees are usually grown from seed. Since the seed coat is very hard, the seed should also first be soaked in boiling water as described under prosopis.

"The young plants do not transplant well, because the long taproot is usually damaged in the process. It is, therefore, recommended that the seed should preferably be sown in situ, or otherwise single seeds can be sown in one-gallon (or larger) tins, and when the plants are about 5 to 12 inches high the tin can be cut open at the bottom and the seedlings planted well and all in well prepared holes 20 to 25 feet apart.

[illegible]

[illegible] grafting has not yet been [illegible] on a large scale. The only known grafted trees are [illegible] on a farm at Addo. The trees at Stellenbosch were started in [illegible] with scions of a good strain growing in Pretoria, but according to the latest report (1933) they had not yet produced [illegible] than three raised from seed. It should be added that the best [illegible] for sale, is gathered only from trees which have [illegible].

Under favourable conditions, seedlings should bear in [illegible] two to six year, and grafted trees [illegible] the third to fourth year.

Analysis of the Kernels. Below is an analysis of the kernels made by the Chemical Division of the Department of Agriculture. For purposes of comparison the analysis of walnut and [illegible] are also included.

Analysis of the Kernel of Walnut and Hickory

Species	Protein Per cent	Carbohydrates (Sugar and Starch) Percent	Fat Per cent	Fibre Per cent
Pecanpie	10.7	58.7	1.0	10.2
Gleditsia	23.3	58.2	4.6	[illegible]
Carob	7.4	75.5	2.8	[illegible]
Walnut	9.8	73.1	4.7	[illegible]
Inyanga Nut	15.5	70.6	2.1	[illegible]

The trees described above will, of course, yield the best results on fertile soil which is suitable for other profitable crops. The planting of the trees on the best agricultural soil is only, however, recommended. In the drier parts of the country they should rather be planted on the poorer types of soil which are unsuitable for better crops, or where the crops are very uncertain. The results obtained in areas where the trees have already been established and are to-day proving a great asset to the farmer should encourage further plantings of these very valuable fodder trees. (E.B. Seeds of these trees are obtainable from the Department of Forestry, Pretoria)

* * *

By Prof. J. L. Bond, 32 Ann. Rept. Ohio State Hortic. Soc. 1931, Pp. 71-2:

"While the native tree had evolved some variation in Europe, there it has there sported into different varieties, with markedly varied habits of growth. This tendency to variation is manifested in growing its seedlings, and we have seen that one

[illegible] Florida, [illegible] of [illegible] habit of growth, and [illegible] hardiness of trees [illegible] prairie. Our correspondents [illegible] that this is a true locust [illegible] like the honey-locust. It [illegible] for sprouting and [illegible] to the attack of the borer. We wish to repeat that it does not sprout any more than the maple, and that no form of insect has yet molested it, except a long-necked beetle often found on potato vines, called by Harris [illegible] [illegible]. Plants in nursery and young orchard are sometimes set [illegible] by these hungry fellows at work in their foliage. The only effect observed, aside from a brief check of growth, is that the plants so treated become more thorny than those untreated. Several American writers, following Loudon more closely than is acceptable, say "The wood of the honey-locust, when dry, weighs 52 pounds to a cubic foot. It is very hard, splits with great difficulty, resembling in this and some other respects that of the common locust." Loudon really wrote, "Splits with great facility", which agrees with my practical experience. I have experimented with this timber as a fence material, dating back nearly twenty-five years. Some rails of that age, made from tough native timber, rotted on posts, have outlasted three sets of posts and two sets of rails, and the locust rails are yet mostly good. These rails were split and nailed on in June and July. Posts were from native timber, seasoned one summer before setting, since with white-oak posts treated in the same way, lasted usually well. Some long-lived locust posts in this fence, when rotted off, were inverted and lasted ten years longer than a new fence. It is only to add that young timber rapidly grown on our rich prairie soil, will in no case prove as durable as our old native trees. But recent observations in the groves of Illinois at 25 years' growth, makes the fact evident that as growth is impeded by standing thick, and complete occupancy of the soil by roots, the proportion of the sap-wood becomes small, and the heart-wood becomes firm and dry, as noted in the thick growths of the groves. As fuel, the honey-locust rules in value with the red-oak.

"The seed ripens in autumn and may be gathered any time during the fall or winter. But the seed pods are gathered after falling to the ground, the better. In Cedar county, on the Cedar river and at many points on the Iowa, Des Moines, Missouri, and indeed most of the rivers of the State, pods may be gathered in quantity grown on thornless trees.

"Before planting, scald the seeds severely. Part of them will swell. Sift these out with a coarse funding mill sieve. Scald the remainder again; repeat scalding and sifting until all are swollen. The ground should be ready and the seeds at once planted. They will come up in two or three days if the weather be favorable, and their upright growth is so rapid that less care is needed in picking out the weeds from among the plants, than with any other forest-tree seedlings. Very few weeds come with good

[illegible] Diary/ Planted honey locust tree by the Tomb [illegible]
3/7/87 " Planted a honey locust tree to mark grave on site of Mansion. Planting honey locusts in conjunction
10/29/87 " with[illegible] entombing entire honey locust seedling.
7/18/88 " Spaded grounds e.s. of Dependencies between greenhouse garden wall and east end tool house. Ten plant honey locust seed.
1/25/06 " Planting honey locust seed behind greenhouse.
5/29/06 " "...between the Greenhouse Plant and the honey locust of the Th. garden adjoining the Tomb House."
2/6/07 Diary Book 1707/ Outside resolved bolt-header. 1 bag honey locust seed.
4/23/07 Diary Book 1707 Assistant [illegible] out of bed [illegible]. 1 bag of honey locust seeds.
4/29/07 Estimate of Washington 29/18 Hand rail 1 [illegible] Honey Locust on Bowling Alley bridge.
[illegible]
27/67 Diary Twelve honey locust seeds in [illegible] [illegible]
4/27/07 Estimate of Washington 25/20/ Three honey locust seedlings planted on Mt. Vernon [illegible]
7/5/07 Estimate of Washington 29/20. [illegible]
8/3/08 Diary/ Finished [illegible] honey locusts in [illegible].
[illegible] Estimate of Washington [illegible] Directions for planting honey locust seeds.
[illegible] Garden Reports. [illegible] honey locusts at [illegible].
11/14/08 Estimate of Washington [illegible] Directions for [illegible] the [illegible] of honey locusts and for [illegible].
/09/[illegible] Estimate of Washington [illegible] [illegible] honey locust [illegible] to be planted where [illegible] to [illegible].
/4/[illegible] Estimate of Washington [illegible] [illegible] [illegible] [illegible] honey locust [illegible] from [illegible] to [illegible] and [illegible].

[illegible]	[illegible]	[illegible]
[illegible]	Writings of G. Washington 32: [illegible].	Honey locust [illegible] Area [illegible]
1/20/93	Writings of Washington 32: 105.	Sends 6 qts. [illegible] seeds from Philadelphia
1/27/93	Writings of Washington 32: 118.	Honey locust and [illegible] both to be used in live fence around vineyard.
3/10/93	Writings of Washington 32: 301.	Sends 1½ qts. honey [illegible] seeds for planting at Mount Vernon.
4/21/93	Writings of Washington 32: 425.	These seeds to be planted where they "are to stand" or in nursery. (for fence from Hall to Banks).
5/5/93	Writings of Washington 32: 445.	Asks if locust seed has come up
2/22/94	Writings of Washington 33: 276.	Directions for [illegible] honey locust seed.
12/28/94	Writings of Washington 34: 74.	Will send honey locust seeds for hedges
1/11/95	Writings of Washington 34: 84.	Sends from Philadelphia honey locust seed to be raised in nursery for hedges. directions for sowing.
5/24/95	Writings of Washington 34: 205.	Directions for transplanting honey locusts for hedges.
4/22/96	Writings of Washington 35: 66.	Honey locusts set out for hedges, dead.

* * *

[illegible]

[Tested and Promising Plants of Promise. Prepared [illegible] Presented at Sal. [illegible], [illegible], by [illegible]]

[illegible]

Jojoba. The most common shrub found on the southwestern [illegible] region has chaparral millions of acres in the southwestern part of the United States. Its invasion of grazing lands, especially in Texas, has been so extensive and has occurred so rapidly that it may be compared to the inroads of the bell weevil into the Cotton Belt.

Mesquite (*Prosopis juliflora* U.S. and F. *velutina* Torr.) grows over a wide range of territory and will flourish where the more valuable cotton can not exist. It is common in Hawaii, where it was introduced in 1828 and is known as the algaroba or kiawe tree (9), and in Jamaica, where it has been called "Jamaica" [illegible]. It is found also from the southern boundary of Utah and Colorado to Chile, and has been introduced into India and South Africa. Hence it is interesting comparable situation.

Great quantities of mesquite seeds are claimed to go to waste every year in the United States. In an effort to provide their utilization the Bureau of Chemistry undertook an investigation to determine whether or not there seemed to be some economic purpose.

The literature was searched for data on the nutritive value of the mesquite fruit. Samples were analyzed in the laboratory to determine the content of sugar and other crude constituents, and a process for separating the mesquite bean into its component parts was devised. The results of this work, supplemented by notes on cooking and other dietary tests, are given in the following pages.

After a favorable season the quantities of mesquite seeds available over large areas of southwestern United States are limited only by the facilities for gathering the ripe fruit. Tillson (10) states that in southern New Mexico it is not unusual to get a million-pound crop, with a spread of not more than 1½ to 2 feet, bearing from 1½ to 2½ bushels of beans. Although the process of gathering the fruit is tedious, during the 1917 season it could be secured from 20 to 30 cents per 100 pounds. A native worker of the Tucson Agricultural Experiment Station gathered about 175 pounds of dried beans in a day (11). Since the pods weigh but 11 pounds to the bushel (11) however, the man gathered only 21 bushels, but a very strenuous day's work. In a southwestern province of India, a good tree may yield more than 200 pounds of ripe fruit a year (9).

In 1917 mesquite beans were gathered and shipped to Portsmouth in tons (16) and in the preceding year mesquite meal in the United States [illegible] about [illegible] was fed to livestock in Hawaii. [illegible] stated that mesquite beans, gathered by women and children in Hawaii, [illegible] sold for from $7.50 to $10 a ton (24).

The yield of fruit, of course, varies with the type and size of the tree or bush. It has been stated that 1 acre of land well covered with the trees may produce 100 bushels of fruit per year [illegible]. Two crops a year have been produced in Arizona (25) and in Texas, the early crop ripening during the first half of July and the second during the first half of September. Near Tucson, Ariz., the fruit begins to mature early in July. The dry, ripe fruit is said to keep well in storage (5).

Fruit. The fruit of the mesquite tree consists of at least two kinds of food material. The pericarp or pod, which includes the epicarp (outer covering), the mesocarp (sugary pulp), and the endocarp (hull husks or seed capsules), contains nearly all of the sugar and most of the crude fiber, tannins, etc. The nutrients in this portion are wholly available to the digestive tract of animals eating the fruit. On the other hand, the seeds, which constitute the rest of the fruit and contain most of the protein and fat, pass practically unchanged through an animal consuming the natural whole fruit. The ease with which the entire seeds pass unchanged through the digestive tract is undoubtedly due largely to their smoothness, extreme hardness, and small size, as well as in part to the relatively indigestible nature of the seed coat. Experiments recently reported by Cruz indicate that the viability of seeds is not impaired by their passage through the digestive tracts of sheep (5). This property of the practically seed coat of the mesquite bean to resist digestion probably is an important factor in the spreading of the mesquite into new territory.

Undoubtedly much of the nutritive value of the beans is made available by grinding the mature fruit. Such an entire bean meal has been used as an emergency or supplementary forage for stock. There are however, serious obstacles to the extensive use of the beans in this way. Gertie (10) states: "In the (New Mexico) station experiment it was found difficult to grind them after the pods became thoroughly dried. The large quantity of sugar they contained made them so sticky that they clogged the mill." More important is the problem of the whole bean meal to ferment and spoil unless it is kept dry. This would militate against its use as a commercial feedstuff.

Because of the desirability of the two portions of mesquite beans, it is reasonable to assume that the greatest usefulness of mesquite products will be found in treating it as a separate commodity. The problem of the most complete utilization thus resolves itself.

*See note 21 at end of Appendix I

[illegible]

[illegible]

[illegible]

In Hawaii as early as 1828, [illegible] which [illegible] became [illegible] an important [illegible] [illegible] states that "the algaroba, or kiawe (*Prosopis chilensis*), is generally recognized as the most valuable tree which has [illegible] the Territory of Hawaii". He continues:

> The pods are everywhere recognized as one of the most important stock feeds of the Islands and are greedily relished by all kinds of livestock, including chickens. Their (the beans') feeding value has long been recognized from the practical results obtained. As a feeding material there seems to be only one objection to them, and that is a slight flavor given to milk when the beans are fed in excess to the dairy cows. This objection, however, could be overcome by feeding the beans after milking, rather than before milking.

Tunas. Samples of several dried fruit were prepared especially for the purpose of determining whether or not it would be practicable to gather the fruit when still slightly green or whether it would be necessary to allow it to fully mature on the tree. Except for a somewhat higher sugar content in the fruit picked just before maturity and sun dried, there appears to be no significant difference in composition between the two lots.

An effort was made to prepare sugar (sucrose), [illegible] from sample 30178. Sucrose could be obtained from ground whole fruit by any process which would lend itself to commercial use, owing possibly to the presence of the enzymes of the seeds. By slight modification of a [illegible] of mesquite pod material, crystalline sucrose (cane sugar) was prepared and identified by crystallographic criteria. The method of purification used would not be applicable on a commercial scale. Many years ago [illegible] (22) identified the principal sugar of the mesquite pod as sucrose. If sugar were to be prepared from mesquite, the first step in the process of manufacture must be a fairly clean separation of seed material from pod and husk material.

Although the preparation of commercial sugar* for table use is not properly within the scope of this investigation, the analysis of the residue after subjecting the sugar-bearing material of the mesquite bean to water extraction (by diffusion) is pertinent. Samples of pods, husk, and ground whole fruit were treated with boiling water, by diffusion, in such a way as to extract most of the soluble substances. The undissolved residues were dried and analyzed. (Table 9 shows the results. Hot water extracted [illegible] of the solid matter from the entire fruit, and of this extracted material, [illegible] was sucrose. Mesquite bean meal [illegible] of its solid matter under the same conditions, of which the sucrose content was [illegible]).

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*Beet-sugar houses are often idle [illegible] after the close of the [illegible] beet-sugar season. They turn their attention to the manufacture of [illegible] sirup. If an abundant supply of mesquite-pod material were obtainable it is possible that such factories could be operated in the manufacture of sugar or sirup from the pods, provided the problem of harvesting and [illegible] of this material were solved.

Table 3. - Average composition of [illegible] beans

Sample	Carbohydrate basis: Prop. of (moisture free, %)	Carbohydrate basis: Acid (grams) (13 g [illegible] fat)	Carbohydrate basis: Starch	Carbohydrate basis: Total [illegible]	Carbohydrate basis: Tender [illegible]	Carbohydrate basis: Tough [illegible]	Protein basis: Tender [illegible]	Protein basis: Tough [illegible]	Protein basis: Tender [illegible]	Protein basis: Tough [illegible]
	1	2	3	4	5	6	7	8	9	10
Pole varieties										
Pinto and one seed										
Average:										
[illegible]	40.97	32.46	3.72	1.42	6.79	17.30	50.87	4.01	11.73	11.07
[illegible] 1/	5.08	15.32	4.73	1.14	7.17	17.83	49.33	2.13	8.49	----
[illegible] 1/	1.87	67.41	4.38	.87	6.94	18.05	65.92	1.05	9.82	----
[illegible] 1/	3.93	34.40	4.66	.91	7.09	15.17	51.57	1.92	21.79	----
Arizona [illegible] 1/	3.64	13.10	5.33	1.40	6.21	12.88	54.48	----	----	----
Hamilton [illegible] 2/	17.82	------	3.46	.17	6.78	21.99	49.32	----	----	----
Average (9 samples)	8.21	79.16	4.42	1.00	6.69	21.30	54.51	----	----	----
Bush beans:										
[illegible] 1/	5.77	10.38	3.64	4.12	35.79	7.93	40.87	3.01	[illegible]	11.19
[illegible]	7.11	20.48	3.56	5.54	33.85	7.83	49.85	.12	[illegible]	----
[illegible]	6.60	18.37	3.36	3.09	35.65	7.38	49.22	[illegible]	[illegible]	----
[illegible]	4.48	15.56	4.36	3.35	34.33	7.96	43.02	[illegible]	[illegible]	----
Arizona [illegible] 1/	7.82	24.40	3.78	6.05	37.33	6.60	42.42	----	----	----
Hamilton [illegible] 2/	14.32	------	3.26	4.98	37.51	5.53	32.16	----	----	----
Average (9 samples)	6.39	30.84	4.07	4.90	36.27	7.53	41.21	----	----	----
Lupine types:										
Spain (6 samples)	12.3	100	1.1	9.7	10.2	26.8	58.6	----	----	----
Arizona (5 samples)	6.3	100	1.8	9.7	19.5	25.2	58.8	----	----	----
California (2 ")	11.4	100	4.5	1.1	10.9	29.6	47.4	----	----	----
Sea Island (sample 1)	4.8	100	.1	2.6	12.6	33.6	47.4	----	----	
Texas (7 samples)	6.9	100	4.4	1.9	13.7	37.8	39.9	----	----	
Guatemalan:										
Dwarf White (Min.	4.8	100	7.8	1.0	30.3	30.5	39.7	----	----	----
(10 samples) Max.	15.5	100	1.5	3.4	15.1	34.0	48.3	----	----	----
Average	7.2	100	4.6	2.5	19.0	21.4	52.3	----	----	----
Mexico (Tarahita Beans. 2. [illegible] Beans)		100	7.2	1.1	10.3	24.3	55.1	----	----	----

1/ Sources of Pinto (11 samples).
2/ Average values reported by Hamon (16). With slight exceptions the compositions of Pinto (9 samples) [illegible]
3/ Tender [illegible] and [illegible] represent beans from Texas, Arizona and California. The composition of the [illegible] (9 [illegible]) is reported in Table 2.

It was been [illegible] in a [illegible] field at [illegible]. [illegible] crushed the fruit in a "[illegible]". It is possible to refill by filling the entire [illegible] cent of per cent of the sugar [illegible] present in the whole fruit, and the whole seed. The seeds, after being [illegible] or [illegible], may be sold. [illegible] pressing seed kernels in the form of meal or flour containing from 17.5 to more than 50 per cent of the total protein of the fruit and seed cake, a kind of "bran" by-product.

The seed-coat material contains over 15 per cent of pentosans, [illegible] per cent of galactans, and nearly 15 per cent of other readily hydrolizable carbohydrates. The absence of starch makes these [illegible] carbohydrates of interest as a possible source of [illegible] sugars.

Containing over 60 per cent of crude protein, the meats contain, as kernel meal, is one of the richest natural protein concentrates in the vegetable kingdom, although surpassing the oil-free meals of cotton seed and peanuts.

The importance of the satisfactory results obtained in this laboratory experiment should not be considered as a proof of the commercial feasibility of the process. The fruit used had been very thoroughly dried of its heat and the first stage of the milling was conducted in a dry atmosphere. However, in the arid Southwest and for many months in the semi-arid regions, the atmospheric conditions are ideal for such drying and milling.

The average weight per whole bean was 3.083 grams [illegible] and 1.630 grams when air dry (with a moisture content of 20.1 per cent). This means that the fruit was approximately 114 beans to the pound [illegible] and 144 to the pound, air-dry.

The sound first-grade seeds averaged 0.0394 gram in weight each, or 11.111 seeds to the pound. Woman (7) states that the small [illegible] seeds are from one-third to one-fourth inch long. The seeds he [illegible] were heavier than those counted in this investigation, averaging 9.600 weighing a pound.

A careful hand separation of over 700 perfect seeds into the seed coats, or integuments, and kernels gave the following results as based on the air-dry material: Seeds (testas), 47.75 per cent; kernels (embryos), 52.14 per cent.

SOME LIGHT ON CANDY

In reference to the use of the honey locust as a candy food, [illegible] a statement that the pods are relished as sweets, but [illegible] literature in the literature.

Woll, of the University of California, found [illegible] carob pods greatly and that 0.4 pound of these pods is practically as effective as 0.35 pound of ground barley in increasing body weight (16). According to Jaffa and Albee (16), sweet pods have been used successfully also in feeding steers, for which purpose they should be cooked.

Honey Locust (Gleditsia triacanthos L.) Like the mesquite, the honey locust is classed as a member of the order Leguminosae, but it belongs to the family Caesalpiniaceae. It grows in western New York and over a large area south from that region. The fruit ripens from the middle to the last part of autumn. The pods and the young trees are relished by livestock. The ripe pods, with their supply of sirupy pulp, are popular with human beings, especially children. Because of the richness of the fruit in sugars and protein, this plant may prove to be of economic value.

A sample of the sound ripe fruit from a honey locust tree in the United States Department of Agriculture grounds in Washington, D. C., was separated into pericarp and seeds, and the two portions were analyzed. Their composition and that of the whole fruit is given in Table 11.

A comparison of the composition of portions of the honey locust with that of corresponding parts of the mesquite bean shows that, while the locust pods have a slightly lower total sugar content, the entire fruit of the honey locust is materially lower in crude fiber and probably averages somewhat higher in crude protein.

Carob (Ceratonia siliqua L.). The carob, or Saint-John's bread, tree is also a member of the family Caesalpiniaceae. Because of its sensitiveness to frosts, the carob tree is not grown extensively in the United States outside the citrus fruit belts. Condit (6) has studied thoroughly the climatic and soil requirements for the successful cultivation of the tree.

The importation of carob beans into the United States through the Atlantic seaboard is of some consequence. Approximately 400 tons of pulverized beans are consumed annually to flavor chewing tobacco, and the ground pods are utilized to some extent as an ingredient of proprietary calf meals, which they are supposed to make more palatable and attractive. Carob pods grown in southern Europe are extensively used for stock feed, and some of the highly esteemed varieties for human consumption.

According to Condit (6), the older trees should yield from 150 to 350 pounds of fruit annually. Yields as high as 3,000 pounds a tree have been reported from southern Europe. In southern California the estimated yield per tree from 15 to 30 years old ranges from 20 to 400 pounds.

Table 11 gives the results obtained by Jaffa and Albee (16) on the

composition of the pods, seeds, and whole fruit of the carob, as well as the results on imported Italian, Portuguese, and Cyprus carob, based analyses in the Bureau of Chemistry.

Carob has also reported the presence of 1 per cent of starch in carob pod, but none in the seeds. Only traces of lactic acid appear in the pulp. While the carob pods, on an average, are poorer in total sugar and a great deal lower in crude fiber than the honey locust, the whole fruits are deficient in gross protein. In fact, the whole fruit of the carob contains only less crude protein on an air-dry basis as does the honey locust pod of the mesquite.

Table 11. Composition of honey locust and carob

Sample No.	Material	Air-dry basis: Moisture	Moisture-free basis: Crude protein	Ether extract (Crude fat)	Crude fiber	Total sugar (as invert)	Starch	Ash	Lactic acid	Tannin
		%	%	%	%	%	%	%	%	%
	Honey locust: 1/									
20616	Pods (partly)	07.2	3.6	4.0	0.6	7.4	20.0	56.0 2/	0.1	0.0
20616	Seeds	25.7	5.1	5.4	2.7	27.7	10.7	23.7	...	
20662-3	Entire fruit	100.0	4.3	3.9	1.2	14.0	17.0	61.4	...	...
	Carob:									
5781	Pods (partly)	3/ ..	6.4	0.6	.2	4.2	5.1	93.1	...	...
10080	Do.	...	7.4	...	.4	3.7	5.5	...	13.1	[illegible]
Av. of 27 samples	Do. 4/	8.2	12.5	3.2	2.7	5.3	5.9	79.2	12.7	25.2
10090	Seeds	....	9.6	...	1.1	27.6	7.1	...	None	[illegible]
Av. of 6 samples	Do. 5/	11.0	11.7	3.5	2.6	16.7	5.1	66.4	...	...
34131	Entire fruit 6/	100.0	11.1	3.3	.5	5.7	6.3	81.7	...	...
34116	Do. 6/	100.0	8.5	3.4	.7	4.7	8.6	71.0	...	...
34119	Do. 7/	100.0	9.6	3.5	.3	8.7	6.7	62.4	...	...
Av. of 8 samples	Do. 8/	100.0	11.1	3.0	2.5	7.9	10.7	71.1	13.8	[illegible]

1/Gathered from trees (Gleditsia triacanthos L.) growing in Washington, D. C.
2/Contained 20.9 per cent of pentosans.
3/Identified as pods of Ceratonia siliqua.
4/Average of results reported by Jaffe and Allen (16) on California carob.
5/Italian carob.
6/Portuguese carob.
7/Cyprus carob.
8/Contained 11.5 per cent of pentosans.

Summary: Mesquite beans, which grow over large areas in the southwestern part of the United States, in the East Indies, in Hawaii, in South Africa, and in India, should have some economic value.

Meal made from the entire bean may serve as an adjunct or supplemental feed for stock. Analyses in general agree that the fruits of the

mesquite is a valuable feedingstuff when some [illegible] may be harmful to stock if it has been subjected to soaking. A more complete utilization may be made of the beans if they are separated into two distinct products—the sugar-bearing pericarp and the protein-bearing seeds. Such a separation can be effected and that only when the material is kept perfectly dry during the entire process.

Pinole was prepared from the pods of the mesquite which are used in manufacturing sugar. The seed kernels were exceptionally rich in protein and the seed coats contained an unusually high proportion of pentosans, galactans, and other carbohydrates.

The carob, another closely related plant, growing in the citrus-fruit belts of the United States, is also used in the manufacture of stock feeds. Carob pods contain more sugar and much less crude fiber than honey locust pods. The whole fruit, however, contains only from one-third to one-half as much crude protein as either the honey locust or the mesquite.

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* * *

Note # 1 - Recent facts on the economic value of algaroba in Hawaii are given by U. L. Crawford in "Hawaii's Gray Budget" (Hawaiian Planters' Record, 1929) and Thomas one of the most valuable of our forest trees in the lowland areas. It is obviously valid for the life zone of the mesquite of southwestern United States but that is not true. The trees are important botanical differences between them. It is also probable that our algaroba came from Peru, for there is in that region of South America a genuine species which seems to be identical with ours. The first seeds were brought here by Father Bachelot, a Catholic missionary, and the original (Hawaiian) tree was growing until a few years ago in the Kawaiahao section of Honolulu.

From this second tree there are millions of offspring, now growing over the western sections of the Territory, so thoroughly and widespread have been the dissemination—largely natural. Practically all the other areas on the leeward side of the islands have been reached by the landrunning from which Peru comes, sometimes almost impossible. Trees growing from the seeds there in several miles inland and to a height of two hundred feet elevation above sea level. Fully 75,000 acres of well-[illegible] Kona-[illegible] lands are covered by the pod, as are of the mesquite lands covered by it.

The algaroba is a leguminous tree and produces pods which have a very

considerable value as a food for livestock. Many tons of the pods are gathered annually as they fall to the ground and are used for feeding horses, cattle and mules. Sub-ripe seedy pods gathered and sent to Texas may many times be stored up to provide livestock as a supplement to pasture and other forage plants.

Estimates of the yield of algaroba vary between that in some localities it may be as high as 4000 pounds per acre per year, while in others it may not be more than 1000 pounds. Taking 2000 pounds as a conservative average, /Botanist E. P. Wilson of the Pecos Experiment Station estimates in 1913 (Press Bul. 3), p. 7/ that the yield of algaroba pods varies from one to fourteen tons per acre. This is probably excessive,/ and allowing a value of about $20.00 per ton, /the feeding value is considered about equal to that of barley, which averages about $21.00 per ton,/ we find that this species of tree is worth nearly $2,000,000 per year to the Territory for its yield of livestock feed. In 1913 the actual sales of this commodity for food purposes amounted to over $130,000. The volume of sales has not continued in this amount to the present, but the value of the feed is no less real even if it is not reported in commercial transactions.

The pods are not the only valuable feature of the algaroba. The flowers yield excellent honey and the wood is good both for fuel and for fence posts.

The total honey crop of the Territory is worth about $75,000 per year, this being a conservative average of the past ten years. It is a noteworthy fact that we get that 75 percent of the total crop is gathered from the flowers of the algaroba trees. In far as market value is concerned, probably 90 percent comes from algaroba, for honey derived from any other source here is dark and less desirable.

The wood of the algaroba is very hard, when dry, and makes excellent fuel, better by test than oak and hickory. /See C. S. Judd, in Bot. Gaz. Vol. 12, No. 10, p. 238, Oct. 1921./ Its value as fuel wood is impossible even to guess, but the amount must be very large. Like, as charcoal it enters extensively into consumption; an estimate by F. C. Foster places the amount of charcoal consumed at about 100,000 bags worth about $100,000 per year.

Algaroba makes good fence posts after being soaked in oil tanks. There is a boring beetle which quickly reduces the sapwood of dead growths and logs of this tree to rust if they are not surrounded with oil tanks, but after post material has been allowed to lie a few months to wait after it becomes immune to the attacks of the beetle and makes excellent fence posts which withstand decay for several years. Probably over $10,000 worth of such posts are used in a typical year (in Texas).

* * *

[illegible]

[illegible] lists of publications. The following [illegible] the terms Israel and [illegible] are given in [illegible].

Island Region	Total Dry Matter, %	Crude Protein	Ash
			[illegible]
Negative Bank			
Fleuve	[illegible]	[illegible]	[illegible]
Shaag	[illegible]	[illegible]	[illegible]
Israel			
Fleuve	76.3	[illegible]	[illegible]

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* * *

APPENDIX No. 3

Trees on the Island Fleuve

Afforestation on Island is included here because this tree is of the same family as honeylocust and the two trees appear to have similar qualities and possibilities in many ways. In fact, honeylocust certainly has potential values greater than those of the native. Not research and practical tests are needed to develop the latent possibilities of honeylocust. Densities of use have given the latter tree an important economic status in the Old Worlds. Extensive research has been done on uses for and the products. In our Young World, economic necessity has not yet forced us to undertake development of our potential resources. But the day is approaching when the United States must make full use of its resources. Then our native tree-crops will become important. Look for more income from their normal crops, and for additional, profitable by-products from erosion.

* * *

[illegible] Allinde. Income- or carob-tree; Ar. Kharrub; Sp. [illegible] (Algeria); Algarrobo (Spain). Locustbean. A tall spreading tree, 15-30 ft. high, with pinnate leaves. Native of S. Europe, extensively cultivated in the Mediterranean region for its sweet, edible pods. Pods are from 5-10 in. long, nearly 1 in. broad, dark brown in color, and form a considerable article of export in the producing zones. Young pods in spring. They are a valuable preserve and antiscorbutic food for cattle, and are also eaten and relished by human beings. The tree is a slow grower and of great longevity. "[illegible] production for over 100 years". It is in its prime between 50 and 75 years old. [illegible] a single tree may produce as much as 2 or 3 cwt. of fruit a year.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]
([illegible])

[illegible]	[illegible]	
	([illegible])*	([illegible])
Dry Matter	- [illegible]	[illegible]
Protein	- [illegible]	[illegible]
Fat (Et. Ex.)	- [illegible]	[illegible]
Carbohydrates:		
Soluble	- [illegible]	[illegible]
Fibre	- [illegible]	[illegible]
Ash	- [illegible]	[illegible]
Digestible nutrients:		
Protein equivalent	- 1.8	[illegible]
Oil	- 0.7	[illegible]
Carbohydrates:		
Soluble	- 65.5	[illegible]
Fibre	- 3.7	[illegible]
Calculated from digestible nutrients:		
Nutritive ratio	- [illegible]	[illegible]
Per 100 lb.:		
Food value No.	- 87	[illegible]
Starch equivalent	[illegible]	[illegible]

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*Based on tables published by British Ministry of Agr., Bul. 48

* * *

The value of the carob tree on farms in Palestine is reported in B.P.I. Bul. 180, USDA (1910): An acre of carob trees upon arid soil yields a much greater quantity of food matter than an equal area planted with the best alfalfa. The food value of the carob has been known for a long time. It is the basis of the fodder of the English cavalry horses in Malta and of the horses belonging to a tramway company in Naples. It is among the chief exports from the island of Cyprus and the growing of carob trees is one of the best sources of income on the island. [illegible], once planted, the tree continues to yield for many years. There are several well marked races and a few cultivated types that should be secured by the Bureau of Plant Industry. There are few crops so well adapted as the carob to [illegible] conditions in certain parts of the United States. It seems to me to be the ideal [illegible] plant, as it gives a high yield with very little care.

* * *

Carob trees have been grown in California, Arizona, Texas and [illegible] and the pods utilized for forage. Calif. Sta. Bul. [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ornamental Trees

HIGHWAY "With the ever-increasing number of insects and tree dis-
PLANTING. eases, it is becoming more difficult to [illegible] trees
for municipal streets, highways, and roadside [illegible]. The day is gone when we could dig a hole, throw in a few shovels of topsoil, plant a tree, and expect it to reach maturity [illegible] such attention.

"Successful planting depends upon the selection of suitable varieties, proper location and spacing and adequate arrangements for protection from insects, disease and careless human beings, of whom there are many, who do not seem to appreciate the value of a shade tree [illegible] a well planted street may add to the community in which they live.

"Because of the great variety of conditions and [illegible] to be planted, no one species would ever fill the bill even if we should attempt it. In roadside planting where we encounter [illegible] conditions, perhaps the best plan to follow is the use of varieties of trees which we find growing naturally in the immediate vicinity, provided we do not have a changed soil condition through a cut or filling area. Naturally, varieties of trees used in roadside or wide highway spacing may not be suitable for municipal streets or side yards, although we do find many which can be used to good advantage in both places.

"After deciding on a variety, there is still one more important question which the average Shade Tree specialist, who is working on a limited budget as most of us are, [illegible] and spray against insect infestation or fungus infection such as leaf blight, [illegible] and what not?

"[illegible]

"[illegible] (Quoted from: The Shade Tree [illegible])

[illegible] report by [illegible] of the Prairie States Forestry Project, [illegible], Nebraska, [illegible] as Forestry [illegible] 1938, [illegible] from germination tests to determine the effects of storage and seed treatments are presented graphically [illegible] index of emergence as well as the percentage of [illegible] for the various species used, which included Caragana arborescens, Catalpa speciosa, Celtis occidentalis, Crataegus [illegible], Elaeagnus angustifolia, Fraxinus pennsylvanica var. lanceolata, Gleditsia triacanthos var. inermis, Juniperus scopulorum, J. virginiana, Morus alba var. tatarica, Pinus ponderosa, Prunus americana, P. virginiana var. melanocarpa, Rhus trilobata, Robinia pseudoacacia, Toxylon pomiferum, Ulmus americana and U. pumila. A summary of results and recommendations for each species is included."

* * *

ILLINOIS: Thomas Hunt, [illegible], Ill., reports results of [illegible] years of forest planting on his farm (about [illegible] species). "The Honey Locust I consider a useful and beautiful tree. It grows [illegible]. The wood is hard; it has not been injured by cold, blight, or insects, and is easy to raise from seed. If I were commencing again I would plant more of it. It makes a first-class street tree also." In discussion of Hunt's report, J. [illegible], [illegible], Ill., stated: "I have a hedge of Honey Locusts on ground where Osage would not grow, and it is doing nicely. I trim it in June and again in September. I have seen Honey Locusts in groves of large size, and the [illegible] Co. offered me $100 per thousand feet for Honey Locust lumber that was large enough to use in making wagons." (Pp. [illegible], Trans. Ill. Hort. Soc. [illegible])

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MARYLAND: "[illegible] (inconspicuous) reach considerable size near Centreville, Maryland. [illegible] feet in circumference." ([illegible], [illegible] 1939)

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[illegible]: "There is little doubt that the trees along the [illegible] are native to the State. Honey locust beans are [illegible] to have a large sugar content. Formerly at the [illegible] mill [illegible], where the [illegible] was employed in bolting flour, honey locust beans were used to keep the [illegible] from being clogged. The beans [illegible] when the flour is sifted." ([illegible] 1907)

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[illegible]: "[illegible]", by [illegible] 1941. [illegible] a summary [illegible] of the [illegible] trees [illegible]

[illegible]

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Carob Pods

"'Patay', a baked paste prepared from the flour of the carob [illegible] was found to contain a considerable amount of calcium. Many samples from various Argentine provinces gave a calcium content ranging from 0.138 to 0.217 grams per 100 grams of fresh product. Since 'patay' is consumed in large amounts by the poorer classes in the central and northern provinces of the country, who rarely include milk in their diet, it becomes an important source of dietary calcium. Moreover, the carob flourishes in arid [illegible] which are unsuitable for the cultivation of other vegetables. [illegible] is also a good source of vitamin B_1 and riboflavin, but is lacking in vitamin A, nicotinic acid, and ascorbic acid. The vitamin B_1 content of the samples analyzed ranged from [illegible] and the riboflavin content from 107 to 179 [illegible] per 100 grams [illegible]

[illegible] Secadero, M. L. Negrais, and F. [illegible] de [illegible] Carobo de las Zonas de algarrobo en la alimentación humana. [illegible] Argent. Dietologia, [illegible], 1943. As reported in Nutrition Abs. & Revs. 14 (2): 340, Oct. 1944.

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The Carob or Locust Tree *Ceratonia siliqua* L.

by [illegible] (Forest Research Office, [illegible])

In a country like South Africa, where droughts are frequently experienced and the feeding problem during the dry periods is often [illegible] of solution, the establishment of this valuable evergreen tree as a source of a highly nutritious stock feed is worthy of consideration. The tree deserves to be more extensively tried in those situations in areas where the climatic conditions are [illegible] for its successful propagation.

The principle use of this tree is [illegible] [illegible] pods which are in the carob tree, but it is also used [illegible] [illegible] Algerian, Israel Tech, and Mr. Duke's Fruit.

[illegible] is indigenous to Syria, and will [illegible] [illegible] It was then assumed to be native both to Syria and [illegible] According to A. Hamilton, Lord Chancellor of Scotland, [illegible] it is indigenous also in the northern coasts of Africa. [illegible] are thought to have accompanied the Moorish [illegible] [illegible] the Romans in the wilderness, who ate both [illegible] and the sweet [illegible]

the honey, but it must be admitted that the literal interpretation of these terms is far more plausible. It is also claimed that these pods were the husks fed to the swine on which the prodigal son subsisted during his self-imposed exile.

"The cultivation of the Carob tree began in historic times when it was introduced by the Greeks into Italy and carried by the Arabs west as far as Spain and Morocco. At present it is to be met extensively, either in its wild or cultivated state, on the warmer coasts of the Mediterranean and especially in Syria, Cyprus, Palestine, Greece, Asia Minor, parts of Italy, France, Spain, Portugal and the North coast of Africa, where the climate is congenial to it.

"As far as is known the first introduction of this species into South Africa took place about 1870, when a bag of commercial locust beans was imported from England and the seed distributed with special instructions to sow it <u>in situ</u>. Some trees were raised from this stock in the Albany district, Cape Province, and when last reported on some were bearing excellently. More seed was imported subsequently and the tree is now to be found growing in many localities from the Cape Peninsula to the Zoutpansberg.

"<u>Description</u>. The Carob tree belongs to the sub-family <u>Caesalpinieae</u> of the family <u>Leguminosae</u> and is the only known species of the genus <u>Ceratonia</u>.

"It is an evergreen longlived tree attaining under favourable conditions a height of 40 to 50 feet or more. Its leaves are paripinnate, composed of 4 to 8 and rarely more leaflets, which are oval, entire, leathery, dark green and smooth above and paler below. The flowers, which are small and of greenish colour when open, appear in small, red, lateral racemes, bearing 30 to 60 flowers or sometimes more. These racemes are usually borne on branches which are more than one year old. The flowers are succeeded by flat pods from 6 to 12 inches long and about one inch wide when fully developed. The pods contain numerous small seeds arranged in a line along the centre of the pod, each seed being contained in a separate cell formed by the fleshy pulp of the pod. The Carob is a polygamo-trioecious tree, or, in other words some trees bear only male flowers, others only female and others again only hermaphrodite flowers.

"<u>Uses of the fruit</u>. The Carob tree is chiefly cultivated for its fruit or pods which have long been used as a first class food for cattle but have also served to a lesser extent as food for the poor in times of scarcity.

"On account of the abundant sugar and great quantity of nitrogenous and other digestible substances contained in the pods when ripe, it forms a very nutritious and fattening food, suitable for pigs, sheep, goats, cattle, mules and horses. Pigs may be fed almost exclusively on these pods, but they should be mixed with an equal portion of hay, straw, barley or oats for other animals.

"In certain countries Carob pods are also used in large quantities for distillation, and the spirit obtained is considered to be much superior to that produced from other amylaceous substances and sugar beetroot. According to an analysis made by Mezzadroli in Italy it contains about 40 per cent of sugar, and 100 lbs. of these pods will yield with proper treatment from 4 to 5 gallons of spirit or alcohol.

"Carobs are also used in the preparation of refreshing beverages, bread, and sugar-candy, while the seeds are used for making gum and paints, and as a substitute for coffee.

"Climatic and Soil Requirements. This tree is very hardy and will thrive on almost any kind of soil provided that it is not very wet, but it prefers a deep porous and well drained soil. Owing to the development of a very long taproot it can resist droughts exceedingly well. It also prefers a warm climate, the range being about the same as that of the orange, but with little protection for a few winters the range can be considerably extended. Some varieties will even survive temperatures of 18 to 22 degrees of frost.

"Although the species belongs to the winter rainfall areas, some very good specimens are to be found in the summer rainfall areas, such as, for instance Pretoria, where absolute minimum temperatures of about 20° F. are experienced.

"Propagation. The Carob tree is easily propagated by seed, but, owing to the hardness of the seed-coat, the seed should be placed in boiling water, which is then allowed to cool off while the seeds are kept soaking, before sowing.

"Young trees do not transplant well when raised in beds on account of their long taproots, which are usually injured in the process of taking the plants out, and even if such plants do grow they will not be able to develop taproots suitable to resist continual droughts. It is therefore advisable, in order to obtain robust trees, either to sow the seed in situ or to raise the plants in one-gallon paraffin tins cut in half. When the latter method is resorted to, the plants should be planted out, when about 6 to 9 inches high, by cutting the tins open and placing the trees with soil and roots intact into specially prepared pits about 20 feet apart. Plants should be watered regularly during dry periods until well established.

"Under favourable conditions, seedling-trees may be expected to come into bearing when about 6 to 8 years of age and grafted trees in their third or fourth year after grafting. (Age of stocks also about 6 to 8 years). The annual crop is at first very small, but increases rapidly as the age and size of the trees advance.

"On account of the trioecious habit of this species certain trees (the males and hermaphrodites) produce little or no fruits. In order to ensure heavy crops on all the trees, except the few males which are left in the plantations to fertilize the others, seedlings are grafted

in Europe with scions taken from good pod-producing strains, the idea being to get trees bearing almost exclusively female flowers.

"The only grafted trees in South Africa, as far as is known, are two at Kirstenbosch near Cape Town. These originated from scions secured from a heavy bearing seedling tree in Pretoria which were grafted onto seedlings in 1921. Up to 1938, however, the two grafted trees failed to yield heavier crops of fruit than the seedling trees, in fact, the best of the seedling trees are quite as good in bearing qualities as the grafted trees. Both produce good crops of good-sized pods annually. Attempts to import grafted trees or cuttings from Europe have hitherto failed due to the fact that they arrive in a dried out condition after the long journey." --(Jour. of S. African Forestry Assn., April 1940)

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